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WCN24-2067 Regional differences in acute kidney injury in Ugandan children hospitalized for Hypoxemia

Anthony Batte

Rodney Ogwang

Robert Opoka

Sophie Namasopo

Michael Hawkes

See next page for additional authors

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Authors

Anthony Batte, Rodney Ogwang, Robert Opoka, Sophie Namasopo, Michael Hawkes, and Andrea Conroy

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KIDNEY FUNCTION WITHIN INDIAN POPULATIONS: COMPARISONS AMONG PERSONS LIVING IN A CKDU HOTSPOT TO OTHER URBAN AND RURAL REGIONS WITHIN INDIA



Nivetha Subramanian^{*1}, Peter Craig², Poornima Prabhakaran³, Nikhil Srinivasapura Venkateshmurthy⁴, Lindsay Jaacks⁵, Saitesh Mohan⁶, Prashant Jarhyam⁶, Xue Yu⁷, Dorairaj Prabhakaran⁶, Maria Montez-Rath⁷, Shuchi Anand⁷

¹Stanford, Department of Nephrology, United States; ²Inequalities and Health, University of Glasgow's Public Health Evaluation, Glasgow; ³Health Analytics Research and Trends, Ashoka University, Sonapat; ⁴NA, Centre for Chronic Disease Control, New Delhi; ⁵Global Academy of Agriculture and Food Systems, University of Edinburgh, Midlothian; ⁶Centre for Chronic Conditions and Injuries, Public Health Foundation of India, Gurgaon, Haryana, ⁷Department of Nephrology, Stanford University, Stanford,

Introduction: Chronic kidney disease of unknown etiology (CKDu) is a CKD sub-type that disproportionately affects agricultural communities in warmer, tropical climates globally and lacks traditional risk factors for CKD. The Co-Benefits of

Largescale Organic Farming On HuMan Health (BLOOM) study is a cluster randomized trial that is being conducted in a suspected hotspot of CKDu. We aimed to describe the baseline kidney function among BLOOM participants, with

comparisons to another population-based study conducted in both agricultural and urban settings in Northern and Southern India ('UDAY' meaning dawn in Sanskrit). Since estimated glomerular filtration (eGFR < 60 ml/min/1.73m²) is a late threshold of kidney disease, we plan to focus instead on the distribution of eGFR, and whether it differs by region of residence.

Methods: Kidney function was analyzed in adults (18-44 years) from 8 communities in India. UDAY (n=2138) collected data from 4 sites in both agricultural and urban settings in Sonipat, Haryana (North India) and Visakhapatnam ('Vizag'), Andhra Pradesh (South India) starting in 2014. BLOOM (n=1592) collected data from agricultural households for 3 months from August to October 2022 from 4 districts in Andhra Pradesh which also included Vizag. Both studies used IDMS-calibrated creatinine assays. We compared CKD EPI (2009) eGFR by men versus women, north versus south, and urban versus rural and used the Wilcoxon-rank sum test. We present age and sex-stratified distribution of eGFR by these geographical subclassifications.

Results: Men had lower median eGFR (indicating worse kidney function) than women across both rural and urban areas in UDAY (107.0 versus 110.3 mL/min/1.73m², p < 0.01) and in BLOOM (87.4 versus 89.9 mL/min/1.73m², p < 0.01). Both men and women in rural areas had lower eGFR than their counterparts in urban areas. BLOOM participants had the lowest eGFR for both men and women.

Table 1: eGFR for UDAY and BLOOM by gender, location (north versus south), and rural-urban status

Age	North / Rural UDAY	South / Rural UDAY	South / Rural BLOOM	North / Urban UDAY	South / Urban UDAY
Men 18-44y	n = 374	n = 503	n = 764	n = 506	n = 516
Mean eGFR ± SD	106.8 ± 12.7	102.1 ± 16.3	86.1 ± 18.3	108.1 ± 13.4	100.4 ± 14.4
Median [25%, 75%]	108.9 [99.9, 114.9]	106 [91.6, 113]	87.4 [73.5, 98.7]	110.0 [103.2, 116.1]	102.7 [90.0, 111.2]
Women 18-44y	n = 659	n = 707	n = 808	n = 644	n = 723
Mean eGFR ± SD	109 ± 12.0	107 ± 16.4	92.9 ± 18.9	111.1 ± 11.6	109.8 ± 13.3
Median [25%, 75%]	111.6 [103.1, 117.4]	111.6 [99.7, 117.7]	92.5 [79.8, 104.4]	113.0 [106.5, 118.7]	113.0 [102.9, 118.2]

Conclusions: Our preliminary analyses suggest that there is a population-based difference in eGFR distribution based on location, with participants in southern agricultural communities having lower eGFR than urban areas in the same geography and lower eGFR than northern rural or urban areas. Finally, the BLOOM study had the lowest eGFR for both men and women.

I have no potential conflict of interest to disclose.

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REGIONAL DIFFERENCES IN ACUTE KIDNEY INJURY IN UGANDAN CHILDREN HOSPITALIZED FOR HYPOXEMIA



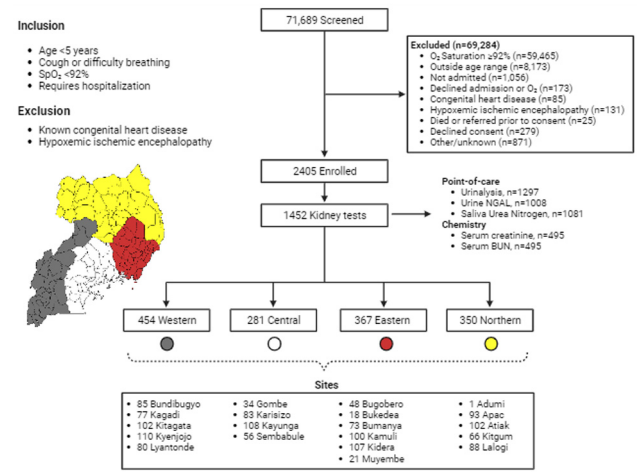
Anthony Batte^{*1}, Rodney Ogwang², Robert Opoka³, Sophie Namasopo⁴, Michael T. Hawkes⁵, Andrea Conroy⁶

¹Kampala, College of Health Sciences, Uganda; ²College of Health Sciences, Makerere University, Kampala; ³Medical College, Aga Khan University, Nairobi; ⁴Medicine, Hoima Regional Referral Hospital, Hoima; ⁵Department of Pediatrics, University of Alberta, Edmonton, ⁶Indiana University School of Medicine, Indiana University, Indianapolis,

Introduction: Acute kidney injury (AKI) is associated with increased mortality in hospitalized patients and incidence is highest in resource limited settings. The objective of this study was to assess sub-National regional differences in the incidence of AKI in children <5 years of age hospitalized with an acute febrile illness and hypoxemia.

Methods: This was a secondary analysis of a stepped wedge cluster randomized controlled trial, which enrolled children <5 years of age hospitalized with hypoxemia between 2019 and 2021. At least one measure of kidney function was available in 1452 children. A single creatinine was measured at enrolment in a sub-set of 495 children with serum stored and AKI defined using KDIGO criteria where baseline creatinine was estimated using the age-based Pottel equation assuming a normal glomerular filtration rate of 120mL/min per 1.73m². Markers were divided into structural (uNGAL positive, proteinuria, hematuria) or functional (AKI, saliva urea nitrogen (SUN)) measures of kidney injury.

Results: 1452 children were included in this AKI sub-study (Figure 1). The mean age of participants was 1.49 years (standard deviation (SD), 1.21) and 55.7% were male (809/1452). Overall 2.6% of children died (38/1452). The majority of participants enrolled were from the West (31.3%) followed by the East (25.3%), North (24.1%), and Central (19.4%) regions. In general, 48.5% of children had AKI (240/495), the prevalence was highest in Eastern Uganda with 62.4% of children having AKI compared to 25.0% of children in Western Uganda, 44% in Central region and 53% in Northern region (p<0.001). Over a third of children had urine NGAL levels ≥150ng/mL, a marker of structural damage, irrespective of site and rates comparable across sites (p=0.095). Other measures of functional and structural kidney injury varied across sites, proteinuria ranged from 6.3% to 14.0% with rates lower in Central and Eastern Uganda compared to Northern and Western Uganda. Hematuria was over two times more common in Eastern and Northern Uganda compared to Central and Western Uganda. Of all the children 49.0% were positive for malaria based on rapid diagnostic test (RDT) either as positive pLDH or both pLDH and HRP-2. The presence of a single band positive RDT for HRP-2 alone was associated with increased risk of AKI, severe AKI, elevated BUN, a positive SUN test and urinalysis positive for hematuria or urobilinogen (unadjusted p<0.05). Children with a 3-band positive RDT were more likely to have proteinuria, hematuria, bilirubinuria and urobilinogen by dipstick (unadjusted p<0.05). Regional differences in AKI persisted after adjusting for malaria, age, and sex.



Conclusions: As we move towards the ISN Oby25 initiative which aims to eliminate preventable deaths from AKI worldwide by 2025. This study provides key in-country data from a resource limited setting, demonstrating marked regional differences in the incidence of AKI in children hospitalized with hypoxaemia and malaria remains an important predictor of AKI. The substantial within-country heterogeneity of AKI highlights the need for further studies to evaluate regional contributors to local patterns of AKI.

I have no potential conflict of interest to disclose.

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IMPACT OF VENOMOUS ANIMAL BITES ON RENAL FUNCTION: AN ANALYSIS OF THREE CLINICAL CASES



Raul Desvars^{*1}, Elena Schupp², Alessandra Ramirez³, Jorge Rojas⁴

¹Concepcion, Concepcion, Paraguay; ²Concepcion, Hospital Regional de Concepcion, Servicio de Nefrología, Concepcion; ³Concepcion, Hospital Regional de Concepcion, Unidad de Cuidados Intensivos, Concepcion; ⁴Concepcion, Universidad Nacional de Concepcion, Facultad de Medicina, Concepcion,

Introduction: The bites of venomous animals are a significant concern for global health, often leading to a wide range of clinical manifestations and complications (1)(2). These poisonings can result from bites or stings from various creatures, including snakes, spiders, and insects. Although the immediate effects of these poisonings are well-documented, the long-term impact on organic systems, particularly renal function, remains an area of ongoing research. The kidneys play a fundamental role in maintaining the body's internal balance by regulating fluid and electrolyte balance and removing waste products from the bloodstream. In this context, they are particularly vulnerable to the systemic effects of venom toxins introduced during a poisoning event. While numerous case reports and clinical studies have detailed the consequences of venomous animal bites on renal health, comprehensive analyses focused on the collective experiences of multiple cases are relatively limited. This study presents a detailed examination of three distinct clinical cases, each involving a different type of encounter with venomous animals, with a specific focus on the impact on renal function. By analyzing these cases collectively, we aim to provide a broader understanding of the varied clinical presentations and long-term renal consequences associated with poisonings. Additionally, we intend to shed light on possible diagnostic and management strategies to optimize patient outcomes in such scenarios. The study references work by Moura Silva et al in Brazil, indicating that the most frequent ophidian accident is caused by the *Bothrops* genus. Similarly, a study by Cedeño and Toro in Peru concludes that this snake genus records the highest cases of renal insufficiency (16.43%) (3)(4). In Paraguay, especially in border departments with Brazil, *Bothrops* envenomation is also the most frequent (5). Botropic envenomation is characterized by being proteolytic, coagulant, and hemorrhagic, with potential effects on both local and systemic levels, including renal involvement that may progress to acute kidney injury with anuria, and coagulation disorders, and hemodynamic instability (6)(7). The violin spider, known as 'ñandupé' in Paraguay, belongs to the *Loxosceles* genus and is medically relevant due to its bite causing necrosis, hemolytic anemia, and severe renal failure, sometimes with fatal consequences. The toxicity of the violin spider's venom in humans is attributed to phospholipases D, metalloproteases, and cysteine knot inhibitors (8)(9). Within insect bites, it's crucial to differentiate between bee and wasp stings, noting that a bee's stinger remains embedded in the skin after the sting, leading to its death, while a wasp's stinger does not, allowing it to sting multiple times. Wasp venom contains inflammation mediators, hyaluronidase, and antigenic proteins responsible for anaphylactic reactions (10). The clinical nature of hymenopteran envenomations contrasts with other animal venoms, including other arthropods, primarily because allergic reaction, not direct intoxication, is the primary concern. Clinically significant toxic envenomations by bees require a massive number of stings, often in the range of hundreds to thousands, although a smaller number of stings causing severe conditions have been reported, and some individuals have survived several thousand stings or, in the case of a baby, several hundred stings (11). During the period from January 2022 to November 2023, one spider bite, one snakebite,

and one bee sting accident were reported, all requiring hemodialytic treatment. In our hospital center, consultations for insect bites are infrequent, making this case report particularly significant.

Methods: Retrospective observational study of a quantitative descriptive nature with a non-experimental design.

Results: Case one: A 44-year-old male patient with a pre-hospital scenario of a violin spider (ñandupe) insect bite approximately 15 days ago, presenting cellulitis in the lower limb. He reports delayed consultation and subsequent admission to the Chaco hospital. Twenty-four hours later, he requests voluntary discharge and comes to our hospital, where he is admitted to the Intensive Care Unit for hemodynamic monitoring. The patient is in a fair overall condition, lucid, afebrile, eupneic, with stable hemodynamics requiring vasopressors, a urinary output of 1800 ml/12 hrs, and no presence of edema. Antibiotic therapy with piperacillin + tazobactam and vancomycin is administered, adjusted according to estimated glomerular filtration rate (eGFR). The patient undergoes surgery for debridement of necrotic tissue and fasciotomy in the area affected by the post-spider bite infectious process. Vital signs: Blood pressure: 116/60 mmHg Heart rate: 94 bpm Temperature:

36.5°C Oxygen saturation: 99% Admission diagnoses: 1. Acute Renal Failure 2. *Loxosceles* spider bite (ñandupe) 3. Septic shock involving skin and soft tissues 4. Necrotizing fasciitis of the right lower limb 5. Immediate postoperative state after debridement and fasciotomy of the right lower limb 6. Cellulitis of the posterior aspect of the right lower limb 7. Type 2 Diabetes Mellitus Hemodialysis is initiated, and serology for Hepatitis B, Hepatitis C, HIV is requested. Approximately 48 hours after admission to our hospital, daily hemodialysis treatment begins, completing a total of ten sessions. See tabla 1. Final Diagnoses: 1. Pre-renal Acute Kidney Injury (AKI) 2. Septic shock originating from the skin and soft tissues due to Hemolytic Group A *Streptococcus* B or pyogenes. 3. Necrotizing fasciitis of the right lower limb 4. Compartment syndrome of the right lower limb 5. Postoperative state after debridement and fasciotomy of the right lower limb 6. Cellulitis of the right lower limb following a spider bite (ñandupe) 7. Type 2 Diabetes Mellitus 8. Severe anemia. The patient maintains urinary output through a bladder catheter with physiological values, but with a worsening general condition, leading to a decision to transfer to a more complex hospital where the patient eventually passes away. Case two: A 33-year-old male patient with a history of bee stings. Information provided by the patient and accompanying family is credible. They report that approximately 18 days ago, the patient was stung by a wasp. They cannot specify the quantity but describe being completely surrounded, receiving stings on the face, anterior chest, and limbs. Four days ago, he sought medical attention due to general malaise, nausea, vomiting, and respiratory distress, initiating oral treatment. With worsening symptoms, he decided to go to the emergency department at the Regional Hospital of Concepción, where Kussmaul breathing, dry mucous membranes, and a distressed facial expression were observed. Upon admission, the patient is conscious and cooperative. Stable hemodynamics with a tendency towards tachycardia and hypertension, tachypneic with poor respiratory mechanics. The patient is anuric. Vital signs: Blood pressure: 183/110 mmHg Heart rate: 132 bpm. Oxygen saturation: 95% with supplemental oxygen at 10 liters through a facial mask. Axillary temperature: 36°C. Admission to the Adult Intensive Care Unit (AICU): Admitted on a stretcher, accompanied by nursing staff, with psychomotor agitation, Glasgow Coma Scale 12/15 due to the absence of verbal response, poor respiratory mechanics with oxygen through a facial mask, stable hemodynamics, indwelling urinary catheter with no output. Sedation and orotracheal intubation are performed for mechanical respiratory assistance (MRA), obtaining central venous access for hydration/medication, and femoral venous access with a double-lumen catheter for hemodialysis. VITAL SIGNS: HR: 89 BP: 125/67 RR: 16 SPO2: 100% TEMP: 35.5°C AICU Admission Diagnosis: 1. Acute renal failure 2. Severe acute respiratory failure requiring MRA 3. Severe metabolic acidosis 4. Severe hyperkalemia 5. Severe dehydration. See tabla 2. An emergency conventional hemodialysis session is initiated with zero net ultrafiltration for two hours, with good tolerance to the treatment. Final Diagnoses: 1. Spider bite 2. Pre-renal acute kidney injury 3. Mixed shock (hypovolemic and septic) 4. Necrotizing fasciitis of the right lower limb 5. Compartment syndrome 6. Postoperative state after debridement and fasciotomy of the right lower limb 7. Cellulitis of