POS-069

HIV INFECTION AND ACUTE KIDNEY INJURY INTERACT TO INCREASE MORTALITY IN CHILDREN HOSPITALIZED WITH ACUTE MALNUTRITION

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BACKGROUND

- Malnutrition is associated with high mortality among children in sub-Saharan Africa and is exacerbated in the context of HIV infection
- Acute kidney injury (AKI) is a common complication in hospitalized children
- There are limited data on the prevalence of AKI in children with malnutrition due to challenges in defining AKI in children with low baseline creatinine

MATERIALS & METHODS

Study Population

- Prospectively recruited 185 children aged 6 months to 10 years hospitalized with acute malnutrition (weight for height or weight for age z-score <-2)
- AKI was assessed using change in creatinine on admission, 24-48 hours of hospitalization, and day 7 or discharge.
- Evaluated two non-invasive AKI point-of-care tests.
  1. Saliva urea nitrogen (SUN) was tested at the bedside using SUN test strips
  1. Urine neutrophil gelatinase-associated lipocalin (uNGAL) was tested using a lateral flow immunoassay and digital CubeReader for quantification.

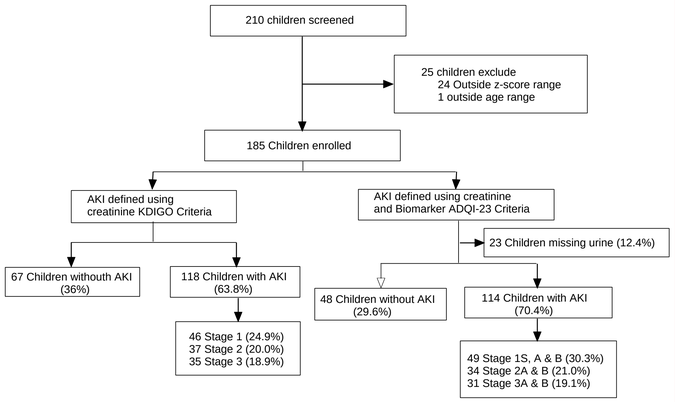

Figure1: Flow chat and prevalence of AKI: AKI defined using serial changes in creatinine was present in 118 (63.8%) and majority of child had stage 1 AKI . AKI defined based on ADQI-23 guidelines using positive uNGAL ≥ 150ng/mL was 70.4%. The majority of AKI was stage 1S, A & B

RESULTS

	No AKI (n=67)	AKI (n=118)	P value	No severe AKI (n= 113)	Severe AKI (n=72)	P value
Clinical Characteristics						
Age, years, median (IQR)	1.25 (0.92, 1.97)	1.1 (0.8, 1.6)	0.526	1.2 (0.9, 1.9)	1.1 (0.8, 1.6)	0.594
Age categories, n (%)						
≤1 years	21 (31.3)	47 (38.8)	0.485	38 (33.6)	30 (41.7)	0.505
>1-2 years	31 (46.3)	50 (42.37		51 (45.1)	30 (41.7)	
>2 years	15 (22.4)	21 (17.8)		24 (21.2)	12 (16.7)	
Sex, n (%) Female	26 (38.8)	41(34.8)	0.581	42 (38.1)	24 (33.3)	0.515
HIV infection, n (%)	9 (14.1)	15 (13.8)	0.956	11 (10.6)	13 (18.8)	0.124
Taking HAART, n (%)	7 (10.5)	11 (9.3)	0.804	10 (8.9)	8 (11.1)	0.613
Fever	27 (40.3)	36 (30.5)	0.177	38 (33.6)	25 (34.7)	0.878
Diarrhea, n (%)	37 (55.2)	71 (60.2)	0.512	**58 (51.3)**	**50 (69.4)**	**0.015**
Vomiting, n (%)	30 (44.8)	65 (55.1)	0.178	55 (48.7)	40 (55.6)	0.361
Unable to drink/breastfeed, n (%)	11 (16.4)	24 (20.3)	0.513	19 (16.8)	16 (22.2)	0.360
Severe anemia, hemoglobin<8.0g/dL	12 (17.9)	25 (21.2)	0.592	20 (17.7)	17 (23.6)	0.327
Splenomegaly, n (%)	1 (1.5)	2 (1.7)	1.000	1 (0.9)	2 (2.8)	0.254
Hepatomegaly, n(%)	5 (7.5)	12 (10.2)	0.540	**7 (6.2)**	**10 (13.9)**	**0.040**
Reduce urine output, n (%)	3 (4.5)	6 (5.1)	1.000	5 (4.4)	4 (5.6)	0.738
Laboratory Findings						
WBC x 10^3/µL	11.1 (8.3, 16.1)	12.2 (8.9, 16.5)	0.067	**11.0 (7.9, 15.1)**	**13.1 (10.3, 19.0)**	**<0.001**
Neutrophil count x 10^3/µL	**3.4 (1.7, 5.2)**	**4.0 (2.5, 8.0)**	**0.010**	**3.1 (1.9, 5.0)**	**4.9 (3.2, 8.6)**	**<0.001**
Hemoglobin, g/dL	10.0 (8.8, 11.6)	9.7 (8.0, 10.9)	0.141	10.0 (8.4, 11.2)	9.6 (8.0, 11.0)	0.068
Platelet count x10^3/µL	434.0 (298.0, 544.0)	338.7 (232.2, 491.0)	0.067	390.0 (264.8, 531.5)	382.0 (229.3, 499.0)	0.637
Sodium mmol/L	136.0 (134.2, 138.2)	135.0 (132.8, 138.1)	0.054	135.3 (133.6, 138.1)	135.1 (132.8, 138.5)	0.392
Potassium mmol/L	**3.9 (3.7, 4.1)**	**3.9 (3.6, 4.2)**	**0.001**	3.9 (3.6, 4.1)	3.9 (3.6, 4.3)	0.494
Sepsis, n (%)	11 (16.4)	11 (9.3)	0.152	13 (11.5)	9 (12.5)	0.838
Malaria, n (%)	2 (3.0)	5 (4.2)	1.000	7 (6.2)	0 (0.0)	N/A
Urinary tract infection, n (%)	3 (7.1)	8 (16.0)	0.192	**4 (6.7)**	**7 (21.9)**	**0.011**
Acute infection, n (%)	16 (23.9)	23 (19.5)	0.482	23 (20.4)	16 (22.2)	0.761
Blood urea nitrogen	**5.0 (3.2, 7.5)**	**5.9 (3.4, 9.6)**	**<0.001**	**5.2 (3.1, 7.5)**	**6.4 (3.5, 11.2)**	**<0.001**
Saliva urea nitrogen (mg/dL)						
1 (5-10)	29 (43.3)	51 (43.2	1.000	54 (47.8)	26 (36.1)	
2 (11-20)	35 (52.2)	61 (51.7)		55 (48.7)	41 (56.9)	
3 (21-30)	3 (4.5)	5 (4.2)		4 (3.5)	4 (5.6)	
5 (41-50)	0 (0)	1 (0.9)		0 (0.0)	1 (1.4)	0.213
Positive Saliva urea nitrogen	38 (56.7)	67 (56.8)	0.993	59 (52.2)	46 (63.9)	0.118
Urine ACR, n (%)						
< 3 mg/mmol	24 (38.1)	32 (29.1)	0.472	38 (36.9)	18 (25.7)	0.134
3–30 mg/mmol	26 (41.3)	51 (46.36		46 (44.7)	31 (44.3)	
>30 mg/mmol	13 (20.6)	27 (24.6)		19 (18.5)	21 (30.0)	
Positive urine NGAL >150ng/ml	8 (13.3)	36 (35.3)	0.002	14 (14.4)	30 (46.2)	<0.001

Table 1: Risk factors for AKI and severe AKI. Children with AKI stages 2 & 3 were categorized as having severe AKI. Children with severe AKI had higher white blood cell counts (WBC) and higher neutrophil counts and were more likely to have a urinary tract infection as depicted in the table.

The presence of diarrhea, splenomegaly, hepatomegaly, leukocytosis, higher neutrophil counts and a urinary tract infection on admission were associated with severe AKI (p<0.05 for all) following adjustment for age and sex.

Measure	Survived n/N (%)	Died n/N (%)	IRR (95% CI)	aIRR (95%CI)	P value
KDIGO defined AKI					
No AKI	60 (37.5)	7 (28.0)	Reference		
AKI	100 (62.5)	10 (72.0)	1.5 (0.6, 3.9)		0.362
Stage 1	43 (26.9)	3 (12.0)	0.6 (0.2, 2.3)		0.483
Stage 2	33 (20.6)	4 (16.0)	1.0 (0.3, 3.3)		0.940
Stage 3	24 (15.0)	11 (44.0)	3.0 (1.3, 7.1)		0.012
Biomarker defined AKI					
No AKI	47(35.6)	1 (4.6)	Reference		
AKI	93 (66.4)	21 (95.5)	8.8 (1.2, 64.3)		0.029
Stage 1S, A & B	42 (30.0)	7 (31.8)	6.9 (0.9, 54.0)		0.065
Stage 2A & B	39 (21.4)	4 (18.2)	5.6 (0.7, 48.6)		0.103
Stage 3A & B	21 (15.0)	10 (45.5)	15.5 (2.1, 115.7)		0.007
HIV interaction with AKI					
HIV	16 (10.7)	8 (34.8)	3.3 (1.6, 7.0)		0.001
Severe AKI	57 (35.6)	15 (60.0)	2.4 (1.1, 5.0)		0.022
Positive SUN	82 (51.3)	23 (92.0)	8.8 (2.1, 36.2)		0.002
High risk NGAL	30 (21.4)	14 (63.6)	4.7 (2.1, 10.4)		<0.001
HIV & severe AKI	8 (5.3)	5 (21.7)	6.0 (2.1, 16.8)		0.001
HIV & positive SUN	12 (7.5)	8 (32.0)	29.2 (3.9, 221.1)		0.001
HIV & high risk NGAL	5 (3.6)	5 (22.7)	8.5 (3.1, 23.0)		<0.001

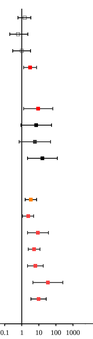

Figure 2. Forest plot depicting relationship between HIV, AKI and mortality.

KDIGO defined AKI was not associated with increased risk of mortality, however, severe AKI, elevated SUN, and a high-risk uNGAL test predicted mortality after adjustment for age and sex.

HIV interacts with AKI to increase the risk of mortality.

CONCLUSIONS

- Prevalence of KDIGO defined AKI and biomarker defined AKI was high, although majority of children had stage 1 AKI.
- The minimum creatinine value recorded over hospitalization was below detection (19umol/L) in 72.0% of children.
- Severe AKI and HIV are risk factors for mortality in hospitalized children with acute malnutrition
- In this high-risk population with low baseline creatinine, two point-of-care tests of AKI strongly predicted mortality and may have broader utility in risk stratification of hospitalized children.

FUTURE DIRECTIONS

- There is need for routine evaluation of AKI in children hospitalized with acute malnutrition.
- There is need for further studies to assess pathophysiology of AKI in acute malnutrition and the utility of point of care testing in diagnosis and predicting prognosis

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