



# Urine Sodium Concentration as a Marker of Poor Growth in Children With Intestinal Failure

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## Introduction

- Children who have undergone significant small bowel resection often have difficulty growing adequately due to fluid and electrolyte losses
- Adequate weight gain is particularly challenging in the setting of high sodium losses in the stool
- Urinary sodium concentration (UNa  $\leq$  30mmol/L) is a more sensitive marker of sodium deficiency than serum levels, and is used to monitor total body sodium status
- The objective of this study was to determine the frequency of low UNa in children after significant bowel resection, and determine if it is associated with poor growth

## Methods

- A retrospective review of children (<19 years) who underwent small bowel resection (requiring parenteral nutrition for > 6 weeks post-operatively) cared for at Children's Health from 2010 to 2016 was performed.
- Patient characteristics, reason for small bowel resection, intestinal anatomy, nutritional intake, anthropometric measurements, and urine and serum electrolytes were collected.
- Z-scores for anthropometric values were compared between children with a UNa  $\leq$  30 mmol/L and > 30 mmol/L.
- Statistical analysis was completed using Mann-Whitney and Pearson's correlation coefficient, providing both 95% confidence intervals and p-values.

## Results

**Table 1.** Patient Demographics and Clinical Characteristics.

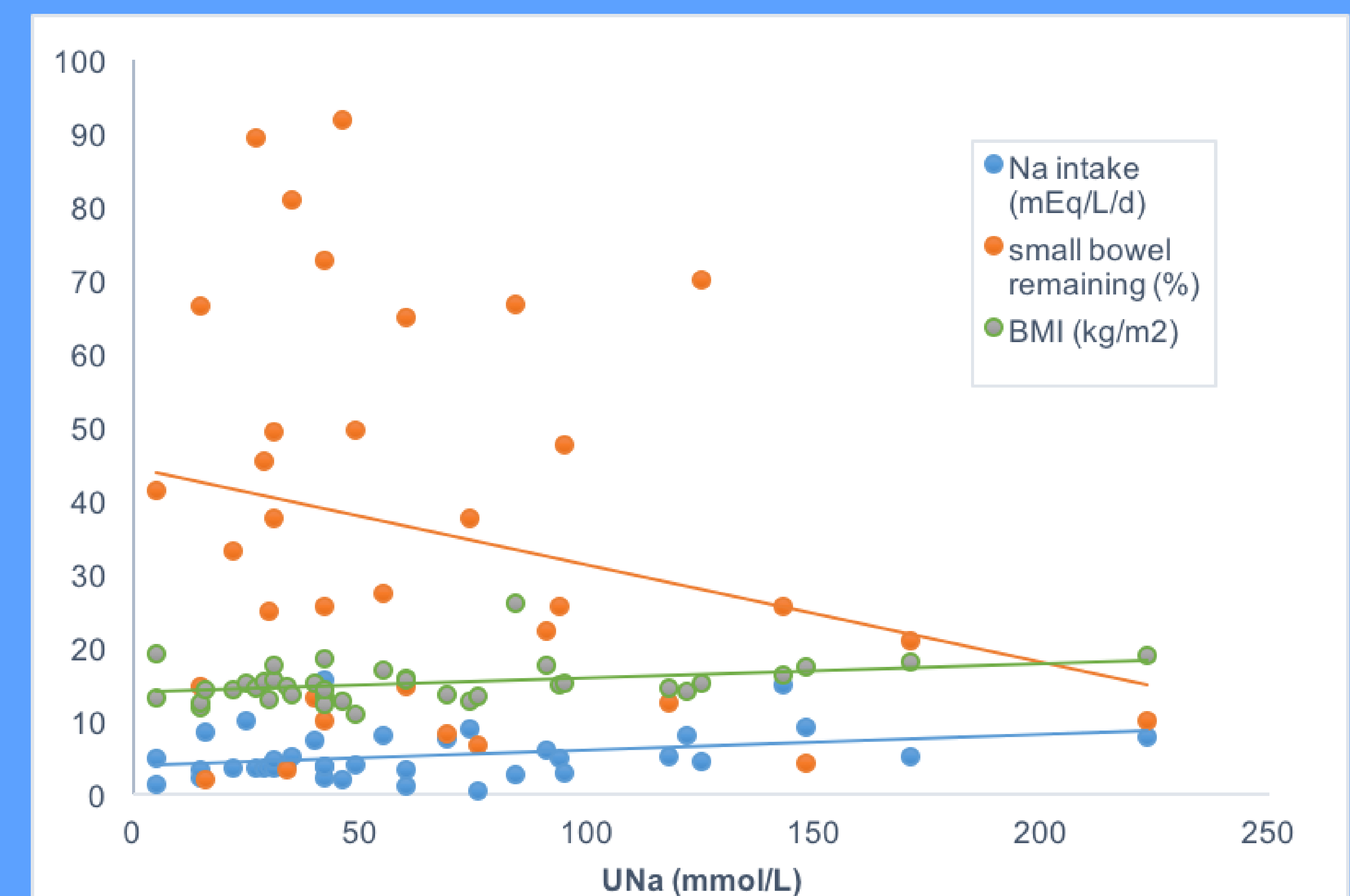
Demographics	Small bowel resection patients (n=38)
Median age in months (range)	8.45 (0.10-218)
Female, n (%)	20 (53)
Clinical Features	
Median small bowel length in cm (range)*	50 (5-315)
Median % small bowel remaining (range)*	27 (2-91)
Reason for resection, n (%)	
Necrotizing enterocolitis	11 (29)
Intestinal atresia	9 (24)
Volvulus	8 (21)
Gastroschisis	5 (13)
Hirschprung's Disease	1 (3)
Other	4 (11)
Median Na intake (mEq/kg/d), (range)	4.25 (0.51-15.62)
Median UNa (mmol/L), (range)	44 (5-223)
UNa $\leq$ 30, n (%)	10 (26%)
UNa > 30, n (%)	28 (74%)

\*n=34

**Table 2.** Anthropometric Measurements and Urine Sodium Concentration.

Anthropometric Values	UNa $\leq$ 30 mmol/L	UNa > 30 mmol/L	p-value
Median z-score weight (range)	-2.46 (-4.09-0.75)	-0.44 (-6.47-1.82)	0.0252
Median z-score height (range)	-2.48 (-3.52-0.26)	-0.98 (-4.05-2.56)	0.0717
Median z-score head circumference (range)	-1.22 (-3.06-0.13)	-0.73 (-2.85-2.27)	0.3735
BMI (kg/m <sup>2</sup> ) (range)	14.25 (11.78-19.11)	15.12 (10.88-26.03)	0.3393

**Figure 1.** Correlation with Urine Sodium.



	Correlation coefficient (95% CI)	p-value
Na intake (mEq/L/d)	0.32 (0.01, 0.57)	0.04
Small bowel remaining (%)	-0.25 (-0.53, 0.08)	0.13
BMI (kg/m <sup>2</sup> )	0.35 (0.05, 0.60)	0.03

## Conclusions

- Children with malabsorption after significant bowel resection are at increased risk for sodium depletion and impaired growth.
- Urine electrolytes should be monitored and patients with UNa  $\leq$  30 mmol/L should receive additional sodium supplementation to maximize growth potential.

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