

## **HYPOTONIC FLUID THERAPY INDUCED HYPONATREMIA IN HOSPITALIZED CHILDREN WITH GASTROENTERITIS AND DEHYDRATION**

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Hypotonic saline solutions have been used for over 5 decades to treat children with diarrheal dehydration. Recently, concern has been raised about the potential risk for iatrogenic hyponatremia as a result of this therapy. The purpose of this study was to look at the incidence and severity of acquired hyponatremia in children admitted to the hospital with acute gastroenteritis and dehydration and treated with hypotonic saline solutions.

We reviewed the medical records of 124 previously healthy children aged 1 month to 12 years (mean age  $3.3 \pm 3.1$  years), admitted to the hospital with acute gastroenteritis and isotonic dehydration (serum Na 130-150 mEq/l) between January 2000 and December of 2005 that had at least 2 serum Na measurement, one on admission and another after 4-24 hours (mean  $13.2 \pm 5.2$  hrs) of IV hypotonic fluid (5% dextrose in 0.2%, in 0.3% or in 0.45% saline) therapy.

There was significant increase in weight ( $12.6 \pm 9.9$  kg to  $12.8 \pm 9.8$  kg), increase in CO<sub>2</sub> ( $17.7 \pm 5.1$  to  $20.0 \pm 4.1$  mmol/l), decrease in Na ( $139.3 \pm 4.2$  to  $137.6 \pm 3.2$  mEq/l), decrease in BUN ( $16.8 \pm 6.6$  to  $8.9 \pm 4.0$  mg/dl) and decrease in creatinine ( $0.42 \pm 0.15$  to  $0.37 \pm 0.14$  mg/dl) with hydration (paired t-test  $p < 0.01$  for all). Of 97 patients with isonatremia (Na 135-145 mEq/l, mean  $140.1 \pm 2.7$ ) on admission, 79 remained isonatremic (Na  $138.3 \pm 2.7$ ) and 18 (18%) became hyponatremic (Na  $133.4 \pm 0.9$ ) with hydration. The drop in serum Na ( $-5.7 \pm 3.1$  mEq/l) was significantly ( $p < 0.002$ ) higher in patients who became hyponatremic than in those who remained normonatremic ( $-1.8 \pm 3.4$  mEq/l). None of the patients developed symptoms of hyponatremia. Of 19 patients who had serum Na of 130-134 mEq/l (mean  $132.8 \pm 1.3$ ) on admission, 14 (73%) became isonatremic (mean Na  $136.7 \pm 2.6$  mEq/l, and a rise of  $3.9 \pm 2.5$  mEq/l) despite hypotonic fluid therapy but 5 remained hyponatremic. Isonatremic patients who became hyponatremic with fluid therapy were older than those who remained isonatremic ( $5.8 \pm 2.7$  vs.  $2.8 \pm 3.1$  years;  $p < .0005$ ) but the rate of initial saline bolus ( $26.1 \pm 10.4$  vs.  $20.2 \pm 8.6$  ml/kg) and the rate of subsequent IV fluid ( $4.3 \pm 1.6$  vs.  $4.8 \pm 1.6$  ml/kg/hour) did not vary. Eighty two percent of patients were on D5-0.3% saline, 15% on D5-0.45% saline and 3% D5-0.2% saline.

It is concluded that although in healthy subjects the ratio of water to Na in serum (6.89-7.40 ml / mEq) is tightly controlled by ADH-kidney axis, mild hyponatremia is common in hypotonic fluid treated children with gastroenteritis and dehydration.