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REFERENCES

1. Mothers feed newborn babies donkey milk. Times of India 2008 May 6; Chennai: Page 6(Col-1)
2. Curative donkey milk in high demand in Chennai. Times of India 2011 Jan 25; Chennai: Page 4(Col- 2).
3. Haroon S, Das JK, Salam RA, Imdad A, Bhutta ZA. Breastfeeding promotion interventions and breastfeeding practices: a systematic review. BMC Public Health. 2013;13:1-18.

Diabetic Ketoacidosis with Normal Anion gap –To Use or Not to Use Normal Saline?

We report a case of diabetic ketoacidosis (DKA) with normal anion-gap secondary to hyperchloremia at admission. Normal saline may not be the ideal fluid for resuscitation in this setting because saline rehydration can induce and/or sustain hyperchloremic acidosis.

A 7-year old child was admitted for evaluation of abdominal pain of 3-week duration. Two days after admission, he developed increasing abdominal pain and tachypnea with normal chest findings. Random blood glucose was 'high' on glucometer. Arterial pH (6.9) and urine ketone bodies (3+) suggested DKA. After 20 mL/kg normal saline (NS) bolus, standard DKA protocol (assuming 10% dehydration) was initiated. Serial measurements of acid-base and electrolyte status are shown in ***Table* I**. Normal anion-gap acidosis and persistent base deficit were noted during the stay. The possibility of underlying distal renal tubular acidosis [1] was ruled out based on renal bicarbonate excretion and urinary anion-gap.

Hyperchloremic metabolic acidosis (HMA) in DKA, especially during recovery, have been reported [2] The mechanism of early HMA in our case could be gradual development of ketoacidosis and persistent urinary loss of ketoanions. A normal corrected sodium level in our patient suggested adequate oral water intake before

TABLE I ELECTROLYTE AND ACID–BASE PARAMETERS OBSERVED DURING THE PICU STAY

	Time (hours)							
Parameter	*0*	*4*	*10*	*16*	*28*	*38*	*48*	*65*
Na^+ (mEq/L)	154	150	144	145	138	132	135	136
K^+ (mEq/L)	1.5	2.0	2.5	2.8	3.0	3.9	4.2	4.4
Cl^- (mEq/L)	142	135	128	123	118	108	112	112
pH	6.9	7.06	7.10	7.26	7.30	7.35	7.39	7.40
pCO_2 (mm Hg)	14.2	13.5	14.5	30.7	25.4	29.8	27.8	25.4
HCO_3 (mEq/L)	4.2	4.4	5.0	13.5	12.1	16.6	16.5	15.5
SBE (mEq/L)	–25	–24.8	–22.3	–12.3	–12.4	–7.4	–6.7	–7.26
Anion gap (mEq/L)	9.3	12.6	13.5	11.3	10.9	11.3	10.7	12.9
"AG/"HCO_3	0.15	0.07	0.03	0.08	0.11	0.12	0.23	0.13
SIG (mEq/L)	7.8	–	–	–	16.3	–	–	–
Serum albumin (g/dL)	3.0	–	–	–	3.1	–	–	–
Creatinine (mg/dL)	0.2	–	–	–	0.5	–	0.2	–
Urine Ketone*	3+	2+	1+	1+	–	–	–	–
Urine (mL/kg/hr)	–	7.8	7.6	6.8	5.2	4.0	3.2	3.0
Fall in blood glucose (mg/dL/hr)	–	–	32	50	56	80	–	–

*AG- anion gap; Cl^- chloride; HCO_3- bicarbonate; K+ potassium; Na+ sodium; SBE standard base excess; SIG strong ion gap; *dipstick method; Normal anion gap in our laboratory is 12. Serum lactate at admission was 3.2 mmol/L.*

admission to intensive care unit. HMA in children and adults during DKA management is associated with slow recovery from acidosis [3]. In a retrospective study [4], prolonged intensive care unit and hospital stay were observed in those with non-gap acidosis (secondary to hyperchloremia).

Use of normal saline as a rehydration fluid is known to cause dilutional-hyperchloremic acidosis. A recent trial [5] showed extended insulin requirement and hospital stay in those who received only NS as post-bolus rehydration fluid or those who received NS but were switched to during recovery when compared with children who received only N/2 saline. Earlier resolution of acidosis was observed when *Plasmalyte* (containing sodium 140 mEq/L, potassium 5 mEq/L, chloride 98 mEq/L, magnesium 3 mEq/L, acetate 27 mEq/L, gluconate 23 mEq/L; osmolality: 294 mOsm/L) was used [6] instead of NS in the initial 12-hours of management of DKA. An adult trial comparing NS with Ringer's lactate (RL) failed to show significant difference in time-to-resolution of DKA [7]. The only randomized trial comparing NS with balanced electrolyte solution (BES) for fluid resuscitation in children with DKA revealed that BES consistently prevented HMA [8]. The benefit of BES is attributable to a serum-like pH (7.4) and lower (98mEq/L) chloride content when compared with NS and RL. However, theoretical risk of hyperkalemia exists with use of RL [9]. In India, the lack of universal availability of BES/*Plasmalyte* and N/2 saline limits their use.

Though saline rehydration is the current standard of care, the debate concerning the ideal resuscitation fluid in DKA continues [10]. Normal saline, being neither 'normal' nor physiological (pH 5.5 with a high chloride content) can sustain hyperchloremia as shown in this case. Randomized trials comparing balanced fluids (like RL) with NS for rehydration in DKA are needed to determine the choice of fluid in DKA. Pediatricians must be cognizant of hyperchloremic acidosis in DKA.

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REFERENCES

1. Dymot JA, McKay GA. Type 1 (distal) renal tubular acidosis in a patient with Type 1 diabetes mellitus—not all cases of metabolic acidosis in Type 1 diabetes mellitus are due to diabetic ketoacidosis. Diabet Med. 2008;25:114-5.
2. Oh MS, Banerji MA, Carroll HJ. The mechanism of hyperchloremic acidosis during the recovery phase of diabetic ketoacidosis. Diabetes. 1981;30:310-3.
3. Mrozik LT, Yung M. Hyperchloraemic metabolic acidosis slows recovery in children with diabetic ketoacidosis: a retrospective audit Aust Crit Care. 2009;22:172-7.
4. Kimura D, Raszynski A, Totapally BR. Admission, and treatment factors associated with the duration of acidosis in children with diabetic ketoacidosis. Pediatr Emerg Care. 2012;28:1302-6.
5. Basnet S, Venepalli PK, Andoh J, Verhulst S, Koirala J. Effect of normal saline, and half normal saline on serum electrolytes during recovery phase of diabetic ketoacidosis. J Intensive Care Med. 2012 Nov 19. [Epub ahead of print] doi: 10.1177/0885066612467149
6. Chua HR, Venkatesh B, Stachowski E, Schneider AG, Perkins K, Ladanyi S, *et al*. Plasma-yte 148 vs 0.9% saline for fluid resuscitation in diabetic ketoacidosis J Crit Care. 2012;27:138-45.
7. Van Zyl DG, Rheeder P, Delport E. Fluid management in diabetic-acidosis– Ringer's lactate versus normal saline: a randomized controlled trial. QJM. 2012;105:337-43.
8. Mahler SA, Conrad SA, Wang H, Arnold TC. Resuscitation with balanced electrolyte solution prevents hyperchloremic metabolic acidosis in patients with diabetic ketoacidosis. Am J Emerg Med. 2011;29:670-4.
9. Dhatariya K. Diabetic ketoacidosis. BMJ. 2007;334:1284-5.
10. Olivieri L, Chasm R. Diabetic ketoacidosis in the pediatric emergency department. Emerg Med Clin N Am. 2013;31:755-73.

Management of Bronchiolitis

I read the recent, informative review article [1] on management of bronchiolitis with interest.Through this communication, I wish to seek certain clarifications:

a) Diagnostic confusion in an infant presenting with wheezing as bronchiolitis or viral bronchopneumonia or wheezing due to asthma.

b) Why only first time wheezers were defined as bronchiolitis? Although in the American Academy of Pediatrics guidelines [2], they have refrained from using word 'first time wheezing'.

c) Most common cause of bronchiolitis in developed [3] as well as developing countries [4] is Respiratory Syncytial Virus (RSV) which does not respond to bronchodilators or steroids – the two main therapies otherwise employed in treatment of wheezy infants. In most of the infants presenting with moderate to severe