Cochrane for Clinicians

Putting Evidence into Practice

Oral Rehydration Solutions for the Treatment of Acute Watery Diarrhea

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Clinical Question

What are the most appropriate oral rehydration solutions for the treatment of acute watery diarrhea?

Evidence-Based Answer

Oral rehydration solutions are distinguished by high or low osmolarity and by whether they are made with complex (i.e., polymer) or simple (i.e., glucose) carbohydrates. When oral rehydration solutions with high osmolarity (310 mOsm per L or greater) are compared, polymer-based solutions may result in lower stool output in the first 24 hours and shorter duration of diarrhea than glucose-based solutions. They may also reduce the need for unscheduled intravenous fluids in persons with noncholera diarrhea (number needed to treat [NNT] = 27). When oral rehydration solutions with low osmolarity (270 mOsm per L or less) are compared, the evidence is insufficient to demonstrate a difference between polymer-based and glucose-based solutions. Regardless of osmolarity, polymer-based solutions do not appear to reduce vomiting and electrolyte disturbances compared with glucose-based solutions.[1] (Strength of Recommendation: B, based on inconsistent or limited-quality patient-oriented evidence.)

Practice Pointers

Oral rehydration solutions are essential in the management of acute watery diarrhea. The original oral rehydration solution formulation, introduced by the World Health Organization (WHO) in 1979, consisted of glucose and other electrolytes with an osmolarity of 310 mOsm per L. It improved signs of dehydration but did not reduce stool volume loss or diarrhea duration, and the high osmotic load potentiated fluid losses and electrolyte imbalances. Since 2004, the WHO has recommended low-osmolarity glucose-based oral rehydration solutions.[2]

Starch polymers contain a complex carbohydrate such as rice or wheat. These are slowly broken down into glucose, which may improve transport of sodium and water across the intestinal epithelium. This review sought to determine whether polymer-based oral rehydration solutions, at either high or low osmolarity, are better than glucose-based oral rehydration solutions for reducing symptoms of and complications from acute watery diarrhea.

This analysis included 35 randomized controlled trials of 4,284 patients with acute watery diarrhea and dehydration. The patients were mostly infants and children in India and Bangladesh, but the trials also involved patients in 12 other countries. Seven trials included adults, although adults were never directly compared with children. Patients were excluded if they were unable to take fluids orally, had been diagnosed with shock, or had bloody diarrhea. Twenty-seven of the studies (n = 3,532) used high-osmolarity oral rehydration solutions. Rice was the most common starch in polymer-based solutions.

In studies of low-osmolarity oral rehydration solutions, patients receiving polymer-based solutions had a mean duration of diarrhea that was eight hours shorter (95% confidence interval [CI], –13.17 to –3.30; n = 364) than those receiving glucose-based solutions, but the results were underpowered. One trial measured total stool output and demonstrated a decrease of 25 mL per kg (95% CI, –40.69 to –8.51; n = 99) with polymer-based solutions in the first 24 hours of treatment; aside from small sample size, this study also was not blinded. There was

no significant reduction in the risk of unscheduled use of intravenous fluids (relative risk [RR] = 0.62; 95% CI, 0.36 to 1.08; n = 326), vomiting (RR = 0.56; 95% CI, 0.24 to 1.34; n = 63), or hyponatremia (RR = 0.88; 95% CI, 0.43 to 1.82; n = 145).

In studies of high-osmolarity oral rehydration solutions, patients receiving polymer-based solutions had lower stool output (decrease of 65 mL per kg in the first 24 hours [95% CI, –84 to 47; n = 1,483]) and a mean duration of diarrhea that was 8.5 hours shorter (95% CI, –13 to –4; n = 1,187) than those receiving glucose-based solutions. Both results were statistically significant but limited by heterogeneity. The need for unscheduled intravenous fluids was low in most trials comparing high-osmolarity oral rehydration solutions. However, in a subgroup analysis of patients with noncholera mixed-pathogen diarrhea, results slightly favored high-osmolarity polymer-based solution for a decrease in unscheduled administration of intravenous fluids (RR = 0.63; 95% CI, 0.41 to 0.96; n = 928; NNT = 27). In patients with cholera (n = 535), no significant differences were noted for outcomes of vomiting, hyponatremia, hypokalemia, or persistent diarrhea (more than 10 days).

The Centers for Disease Control and Prevention and the American Academy of Pediatrics endorse the use of commercially available low-osmolarity oral rehydration solutions for rehydration and replacement of electrolytes in adults and children with acute gastroenteritis, but like other international guidelines, they do not include recommendations for polymer-based solutions.[2-5] The WHO's low-osmolarity oral rehydration solution composition is available online.[6] The World Gastroenterology Organisation states that rice-based oral rehydration solutions are superior to standard solutions in the treatment of cholera, but not of noncholera diarrhea.[7] Given that low-osmolarity oral rehydration solutions are the current standard, future studies should compare low-osmolarity polymer-based and glucose-based solutions.

Family physicians treating acute diarrheal illness in resource-rich countries often encounter patients reporting self-treatment with sports drinks, fruit juices, or sodas, all of which tend to have very high osmolarity.[3,4] Although evidence is lacking to show a benefit of oral rehydration solutions for patients in resource-rich countries,[8,9] physicians should counsel patients on the potential harms of high-osmolarity solutions and recommend low-osmolarity formulations that are widely available for purchase. Homemade oral rehydration solutions are generally not recommended because of the potential for errors when mixing. However, diluted (half-strength) apple juice may be as effective as standard oral rehydration solutions in children with mild acute gastroenteritis.[10]

The practice recommendations in this activity are available at http://www.cochrane.org/CD006519.

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