The duration of infantile acute diarrhea involves many related factors. In general, about 75% of episodes of diarrhea last for a week or less, 20% for 8-14 days and 5% beyond 14 days; the last subgroup is defined as persistent diarrhea.

Interventions to reduce duration of diarrheal episodes are likely to minimize the adverse effects of the illness on physical growth and reduce associated mortality. In developing countries, for instance, the mortality rate increases several fold when diarrheal episodes last ≥ 14 days as compared to those that terminate earlier.

With increasing duration of diarrhea, the reduced food intake and nutrient malabsorption resulting from the illness lead to growth retardation and change of marginal malnutrition to a more severe form. Malnutrition in turn causes further prolongation of diarrhea and malabsorption through a series of pathophysiological events. These include ineffective intestinal epithelial renewal, small bowel bacterial overgrowth, alteration in bile salt metabolism, absorption of intact proteins and possibly sensitization to dietary proteins.

MALNUTRITION AND MICRONUTRIENT DEFICIENCY

In malnourished children the average duration of acute diarrhea and the risk of persistence are substantially increased.

Immunoincompetence associated with malnutrition, particularly impaired cell-mediated immunity, delays the clearance of the causative enteric pathogen. Ineffective epithelial cell repair following an acute enteric infection prolongs diarrheal symptoms and malabsorption.

The deficiency of certain micronutrients may promote these effects by prolonging the diarrheal episode. In India, for instance, children with acute diarrhea treated with zinc supplementation had a significantly reduced episode duration and proportion of episodes that became prolonged (duration > 7 days) as compared to those receiving placebo. Daily supplementation with zinc over a subsequent 6-month period resulted in 49% fewer episodes of persistent diarrhea in children over the age of 11 months. Vitamin A supplementation has also been shown to reduce the incidence and prevalence of severe diarrhea as well as diarrhea-related mortality among preschool children.

IMPAIRED IMMUNE FUNCTION

Impaired cell-mediated immunity is associated with longer diarrheal duration independent of nutritional status.

In Peru and Bangladesh, reduced delayed hypersensitivity responses to several skin antigens have been found to be associated with an increased
risk of persistent diarrhea, even after taking nutritional status into account. This transient diminution in cell-mediated immunity is not usually measles-related and the underlying causes remain unexplained; it may be the result of acute viral infections or a transient decline in micronutrient status.

- IgA-deficient subjects have also been shown to be at higher risk of prolonged diarrhea, although it is infrequently encountered.

**SPECIFIC ENTEROPATHOGENS**

- Acute diarrhea may be prolonged as a result of persistence of an initial enteric infection, or repeated infections with different pathogens.

- In general, the pathogens excreted during persistent diarrhea are the same as those reported in acute diarrheal episodes with the exception of rotavirus, which is often detected in acute episodes but rarely in those that become persistent.

- Among the many pathogens examined, enteroaggregative *Escherichia coli* and *Cryptosporidium* have been isolated more frequently in persistent than in acute diarrheal episodes. Inadequate initial treatment often leads to prolongation of Shigella-associated diarrhea. In persistent diarrhea associated with AIDS, *Cryptosporidium parvum*, *Isospora belli*, *Enterocytozoon bieneusi* and *Mycobacterium avium-intracellulare* are frequently identified pathogens.

**RECENT OCCURRENCE OF MEASLES OR ACUTE DIARRHEA**

- Children are at increased risk of persistent diarrhea following an episode of measles or acute diarrhea. Increased persistent diarrheal morbidity following measles is not surprising, given its immunosuppressant effect.

- The basis for an increased risk of persistent diarrhea over the 2- to 3-month period following an acute diarrheal episode is unclear. Possibly, children who develop persistent diarrhea are a subgroup with a high overall incidence of acute diarrhea. Alternatively, an acute diarrheal episode induces alterations in the intestinal epithelium or in immune responsiveness that render subsequent diarrheal episodes more severe or prolonged. Macromolecular intake across damaged epithelium has been postulated. During acute diarrhea, fecal zinc losses are considerably increased, and the resulting low zinc status may predispose to increased severity in the ensuing few weeks.

**TYPE OF FEEDING**

- Breast-feeding is protective against persistent diarrhea independent of socio-economic status.

In breast-fed young infants, use of animal milk supplements leads to a three-fold increased risk of persistent diarrhea.

- The mode of milk feeding during acute diarrhea may influence the severity and duration of symptoms.

  - Breast-feeding during acute diarrhea reduces the severity and possibly the duration of the episode. Concerns about milk feeding are related to possible sensitization to milk protein and to lactose intolerance. Several factors may influence the response to milk feeding during acute diarrhea: the source of milk, amount, type of processing, other foods consumed during the illness, severity of the infection and factors related to the host. Lack of consistency in the findings on this issue in studies from different countries is therefore understandable.

  - Feeding of animal milk as the sole or predominant nutrient source during acute diarrhea may increase the severity and duration of the episode. When milk intake during acute diarrhea is moderate or when milk is offered as part of a mixed diet containing cereals, the clinical outcome is not different from that of milk-free diets. Lactose malabsorption is dose-dependent and it is likely that milk in moderate amounts is well tolerated by most children with acute diarrhea, particularly when mixed with other foods.
The type of animal milk used may also be an important factor. The risk of persistence of acute diarrhea is reported to be greater with cow's milk than with an infant formula. This seems plausible, as cow's milk has a higher osmolarity and the sensitization capability of milk protein in the infant formula is reduced due to spray drying during the manufacturing process.

- The consumption of vegetables, roots, tubers, beans or dry legumes and fruits is not associated with a significant impact on the duration of diarrhea.

**ORAL REHYDRATION THERAPY DURING ACUTE DIARRHEA**

- Rice-based oral rehydration salts (ORS) solution has been shown to substantially reduce the stool output in cholera in comparison to standard ORS solution, but its effect on stool output and episode duration in non-cholera acute diarrhea is relatively small, particularly when the affected children are optimally fed.

- The osmolarity of ORS solutions is an important determinant of diarrheal duration.

Reduction in the osmolarity of the current WHO ORS solution from 311 to 224 mmol per litre reduces stool output by about 30% and the average episode duration by 22% in children with acute diarrhea. Similarly, consumption of hypertonic fluids such as aerated drinks and concentrated fruit juices increases diarrheal severity and duration.

**ANTIMICROBIAL THERAPY**

- During acute diarrhea, antimicrobial agents are only indicated for cholera, dysentery, acute giardiasis or amoebiasis, and associated systemic infection.

- Empirical antimicrobial therapy has not been found to be associated with increased diarrheal duration. However, it is important to recognize that unwarranted antibiotic treatment may lead to *Clostridium difficile*-associated pseudomembranous colitis and hasten the emergence of antibiotic-resistant pathogens.

**PRACTICAL RECOMMENDATIONS**

- Infants should be exclusively breast-fed for the first 4-6 months of life. Breast-feeding should be continued as long as possible, including during diarrheal episodes.

- Give milk cereal mixtures to infants and young children with acute diarrhea instead of animal milk alone.

- Provide early and appropriate drug therapy for acute diarrhea when indicated e.g. shigellosis. Avoid antimicrobials when not indicated and antidiarrheal always.

- Oral rehydration should preferably be solutions having an osmolarity of 224-250 mmol/litre. Hypertonic fluids should not be given during acute diarrhea.

- Ensuring an intake of about 10 mg zinc daily during acute diarrhea may help prevent prolonged episodes in non breast-fed infants.

In conclusion, factors related to the host, the nature of the infectious agent, the intensity of exposure to enteric pathogens, the mode of feeding and inappropriate treatment during the initial period of illness may all influence the duration and severity of acute diarrhea.

Additional Reading


