Acute Diarrhea

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Definition

- Increased total daily stool output; usually with increased water content
- Infants and Children: Stool Output > 10gm/kg/day
- Adults: Stool Output > 200 gm/day

Introduction

- Leading cause of childhood mortality and morbidity in developing nations
- 3 to 5 billion cases per yr. worldwide
- 5 to 18 million deaths per yr.

In industrialized nations - lower mortality

- Incidence 1.3 to 2.5 cases per yr. in children < 5 yrs. of age
- Incidence increases to 4.5 cases per yr. for day care attendees

Functional Anatomy of Intestinal Mucosa

- Functional unit – Villus
  - Tip: Differentiated epithelial cell – absorptive function
  - Crypt: Four cell types
    - Paneth
    - Goblet
    - Undifferentiated (secretory)
    - Endocrine

Transport of Electrolytes

- Transcellular movement
  - Sec. active process
  - Solvent drag
  - Passive process
- Paracellular pathways
  - Solvent drag
  - Passive process
Mechanisms of Acute Diarrhea

- Increased Secretion
- Decreased Absorption:
  - Mucosal Factors
  - Intraluminal Factors

Mucosal Factors

- Altered Mucosal Dynamics:
  - Increased cell turnover
  - Functional Immaturity
- Decrease surface area:
  - Villous atrophy
  - Brush border injury
  - Bowel resection

Mucosal Factors

- Specific enzyme and transport defects:
  - Disaccharidase deficiency
  - Enterokinase deficiency
  - Ion transport defects

Intraluminal Factors

- Increased osmolarity:
  - Malabsorbed solute
  - Excessive ingestion of fruit juices
  - Local production
- Exocrine pancreatic insufficiency
- Bile salt deficiency
- Parasitic disease

Increased Secretion

- Bacterial toxins
- Inflammatory mediators
- Luminal factors:
  - Dihydroxy bile acids
  - Fatty acids
  - Drugs

Osmotic

Stool volume
Moderately increased

Secretory

Very large
Osmotic                   Secretory
Stool volume            Very large
Moderately increased    
Response to fasting     Diarrhea continues
Diarrhea stops          

Osmotic                   Secretory
Stool volume            Very large
Moderately increased    
Response to fasting     Diarrhea continues
Diarrhea stops          
Stool osmolality        Normal
Normal to Increased     
Ion gap                Normal
> or equal 100 mOsm/kg  < 100 mOsm/kg

Causes of Acute Diarrhea
• Infections:
  – Enteric Infections (including food poisoning)
  – Extraintestinal infections
• Drug induced:
  – Antibiotic associated
  – Other drugs
• Food allergies:
  – Cow’s milk protein
  – Soy protein
  – Multiple food allergies

Diarrheal Pathogens in Children
• Infants and Toddlers
  • Common:
    • Rotavirus
    • Enteric adeno
    • Salmonella
    • Shigella
    • Campylobacter
    • Yersinia
    • Giardia

  • Uncommon:
    • ETEC
    • Aeromonas
    • C. difficile
    • Cryptosporidium

Causes of Acute Diarrhea
• Disorders of digestive/absorptive processes:
  – Sucrase-isomaltase deficiency
  – Late onset hypolactasia
• Niacin deficiency
• Ingestion of heavy metals:
  – Copper
  – Tin
  – Zinc
Diarrheal Pathogens in Children

- Children 5 to 12 yrs.
  - Common:
    - Norwalk virus
    - Giardia
    - EPEC
    - EHEC
    - ETEC
    - Salmonella
    - Campylobacter
  - Uncommon:
    - Yersinia
    - Aeromonas
    - C. difficile
    - Rotavirus

Clinical Features

- Fever
- Vomiting
- Diarrhea - watery; blood and mucus in stools
- Abdominal pain
- Dehydration
- Shock

Investigations

- Stool Exam:
  - Gross exam:
    - Color
    - Water content
    - Visible parasites
  - Chemical tests:
    - Occult blood
    - pH
    - Reducing substances
    - Tryptic activity
    - Sodium
    - Potassium
    - Osmolality
    - Magnesium
    - Phenolphthalein
  - Microscopic:
    - Leukocytes
    - Fat globules
    - Macrophages
    - Parasites
  - Rotavirus
  - C. difficile toxin and culture
  - Culture for enteric pathogens and viral cultures
  - Blood:
    - CBC
    - Electrolytes
    - Blood culture
Management

- Rehydration
- Refeeding
- Other treatments

Rehydration

- Cornerstone of Treatment – Oral / IV
- 90% of all the cases can be treated effectively with Oral Rehydration Solution

Rehydration

- Oral Rehydration Solution
  - Mixture of electrolytes and carbohydrates
  - Electrolytes
    - Sodium - 60 to 90 mmol/l
    - Potassium - 20
    - Chlorides - 60 to 90
    - Base - 10 to 30
  - Carbohydrates
    - Glucose - 74 to 111
    - Cooked rice - 50gm/l

IV Hydration

- Volume of fluids and the solution to be used depends on the level of dehydration
- Bolus: 20cc / kg normal saline for resuscitation

Refeeding

- Rapid refeeding after adequate oral rehydration therapy

Other Treatments

- Antibiotics
- Micronutrients - Zinc
- Oral immunoglobulins
- Probiotics - Lactobacilli
- Opiates and antiperistaltic agents
Antibiotic Therapy In Infectious Diarrhea

- Salmonella (infants < 3 months, immunocompromised host)
  - TMP/SMX
- Shigella (severe dysentery, EHEC)
  - TMP/SMX
- Campylobacter jejuni
  - Erythromycin

Antibiotic Therapy In Infectious Diarrhea

- C. Difficile
  - Metronidazole or Vancomycin
- G. Lamblia
  - Metronidazole
- E. Histolytica
  - Metronidazole

Prevention of Infectious Diarrhea

- Hand Washing
- Avoidance of contaminated food, water and surface areas (interrupting fecal-oral spread)

Prevention of Infectious Diarrhea

- Day Care Centers
  - Hand washing
  - Diaper disposal techniques
  - Separating food handling staff from child care staff
  - Separating children by age
- Breast Feeding
- Vaccines