ACUTE DIARRHEA AND FLUID THERAPY

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Aim of Lecture

Approach to acute diarrhea

Approach to Pediatrics Dehydration

Initial Resuscitation

Determine % dehydration

Define the type of dehydration

Determine the type and rate of rehydration fluids

DIARRHEA DEFENITION

- stool weight in excess of 200 grams per day.
- A good working definition is three or more loose or watery stools per day
- A definite decrease in consistency and increase in frequency based upon an individual baseline.
- AD must be differentiated from persistent diarrhoea which is of >14 days duration and may begin acutely. Typically, this occurs in association with malnutrition and/or HIV infection

Acute diarrhea

- Second most common cause of morbidity and mortality worldwide
- WHO estimation (2002), diarrhoeal disease results in:
- 2.5 million people die annually, mostly children
- 1.6 million children <5yrs old (in developing countries)

- Diarrhoeal disease remains a leading cause of morbidity and mortality amongst children in low and middle income countries.
- Most deaths result from the associated shock, dehydration and electrolyte imbalance.
- In malnutrition, the risk of AD, its complications and mortality are increased

ETIOLOGY

- Noninfectious
- Drugs
- malabsorbtion
- Food allergies
- Gastrointestinal diseases such as inflammatory bowel disease
- Other disease states such as thyrotoxicosis and endocrine diseases

Infectious

Box 1 | Causes of acute gastroenteritis in children

Viruses (about 70%)

- Rotaviruses
- Noroviruses (Norwalk-like viruses)
- Enteric adenoviruses
- Caliciviruses
- Astroviruses
- Enteroviruses

Protozoa (<10%)

- Cryptosporidium
- *Giardia lamblia*
- *Entamoeba histolytica*

Bacteria (10-20%)

- *Campylobacter jejuni*
- Non-typhoid *Salmonella* spp
- Enteropathogenic *Escherichia coli*
- *Shigella* spp
- *Yersinia enterocolitica*
- Shiga toxin producing *E coli*
- *Salmonella typhi* and *S paratyphi*
- *Vibrio cholerae*

Helminths

- *Strongyloides stercoralis*

Diagnosis

- History
- Stool examination(GSE)

Mucus
Blood
Leukocytes

- Stool culture Indications :

Immunocompromised
Bloody or invasive
Duration > 14days(chronic diarrhea)
Outbreak of HUS

- CBC
- Serology

Clinical types of AD

- **Clinical typeCommon pathogens**
- Acute watery diarrhoea

This is the most common. It is of recent onset, commencing usually within 48 hours of presentation. It is usually self limiting and most episodes subside within 7 days. The main complication is dehydration.

Rotavirus, *E. coli*, *Vibrio cholera*

- Acute bloody diarrhoea

Also referred to as dysentery. This is the passage of bloody stools. It is as a result of damage to the intestinal mucosa by an invasive organism. The complications here are sepsis, malnutrition and dehydration.

Shigella spp, *Entamoeba histolytica*

Approach to Peds Dehydration

Initial Resuscitation

Determine % dehydration

Define the type of dehydration

Determine the type and rate of rehydration fluids

Dehydration

Dehydration is a condition that can occur with excess loss of water and other body fluids. Dehydration results from decreased intake, increased output (renal, gastrointestinal or insensible losses), a shift of fluid (e.g. ascites, effusions), or capillary leak of fluid (e.g. burns and sepsis).

S & S of dehydration

- Weight loss
- Blood pressure drop
- Delayed capillary refill
- Oliguria
- Sunken fontanel
- Decreased skin turgor
- Sunken eyes
- Dry mucous membranes

WHO guideline for the classification of dehydration

- No dehydration
- Some dehydration
- Severe dehydration

- Treatment recommendations :
  - No dehydration
    - Maintenance of hydration:
    - <10 kg 60-120 mls of ORS following each episode of vomiting or diarrhea
    - >10 kg 120-240 mls of ORS following each episode of vomiting or diarrhea

    - Continue breastfeeding

- Some dehydration
- ORS of 50-100 ml/kg given over 2-4 hours
- Maintenance phase same as above
- Severe dehydration
- Resuscitation with 20ml/kg of Ringers or NS IV

- Rehydration with 100 ml/kg of ORS over 4 hours

Classical classification of dehydration

Mild dehydration (3-5%)

Moderate dehydration (6-10%)

Severe dehydration (>10%)

Table 4. Example of a Commonly Taught Dehydration Assessment Scale*

Variable/Sign	Dehydration		
	Mild (4%-5%)	Moderate (6%-9%)	Severe (≥10%)
General appearance	Thirsty, restless, alert	Thirsty, drowsy, postural hypotension	Drowsy, limp, cold, sweaty, cyanotic extremities
Radial pulse	Normal rate and strength	Rapid and weak	Rapid, thready, sometimes impalpable
Respirations	Normal	Deep, may be rapid	Deep and rapid
Anterior fontanelle	Normal	Sunken	Very sunken
Systolic blood pressure	Normal	Normal or low	Low
Skin elasticity	Pinch retracts immediately	Pinch retracts slowly	Pinch retracts very slowly
Eyes	Normal	Sunken	Grossly sunken
Tears	Present	Absent	Absent
Mucous membranes	Moist	Dry	Very dry

*Adapted with permission from Vega and Avner.[41]

TABLE 3. Composition of commercial oral rehydration solutions (ORS) and commonly consumed beverages

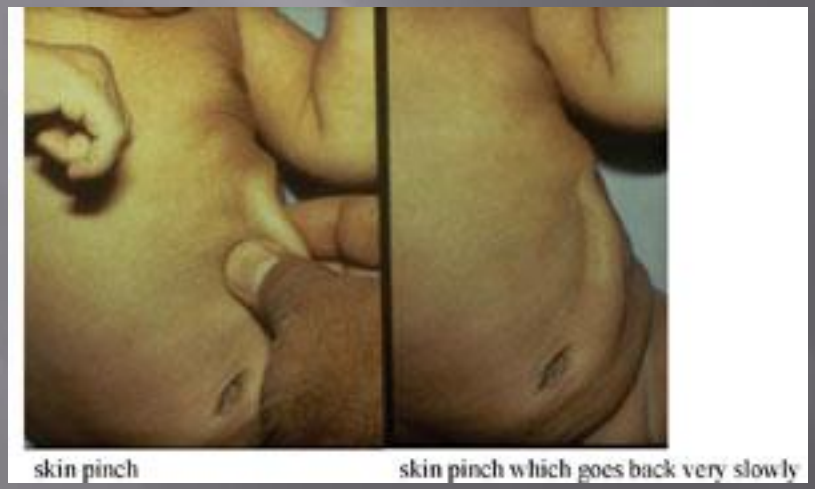
Solution	Carbohydrate (gm/L)	Sodium (mmol/L)	Potassium (mmol/L)	Chloride (mmol/L)	Base* (mmol/L)	Osmolarity (mOsm/L)
ORS						
World Health Organization (WHO) (2002)	13.5	75	20	65	30	245
WHO (1975)	20	90	20	80	30	311
European Society of Paediatric Gastroenterology, Hepatology and Nutrition	16	60	20	60	30	240
Enfalyte®†	30	50	25	45	34	200
Pedialyte®§	25	45	20	35	30	250
Rehydralyte®¶	25	75	20	65	30	305
CeraLyte®**	40	50–90	20	NA††	30	220
Commonly used beverages (not appropriate for diarrhea treatment)						
Apple juice§§	120	0.4	44	45	N/A	730
Coca-Cola®¶¶ Classic	112	1.6	N/A	N/A	13.4	650

- Skin turgor is assessed by pinching the skin of the abdomen or thigh longitudinally between the thumb and the bent forefinger.

- The sign is unreliable in obese or severely malnourished children.

- Normal: skin fold retracts immediately.
- Mild or moderate dehydration: slow; skin fold visible for less than 2 seconds.

- Mild or moderate dehydration: slow; skin fold visible for less than 2 seconds.
- Severe dehydration: very slow; skin fold visible for longer than 2 seconds.
- Other features of dehydration include dry mucous membranes, reduced tears and decreased urine output.
- Additional signs of severe dehydration include circulatory collapse (e.g. weak rapid pulse, cool or blue extremities, hypotension), rapid breathing, sunken anterior fontanels



skin pinch

skin pinch which goes back very slowly

Types of dehydration

Hypernatremic dehydration

- Dehydration, characterized by increased concentrations of sodium (>150 mmol /l) in the extracellular fluid, it results from diarrhea in infants.
- The occurrence of the hypernatremia and hyperchloremia lies in the relatively greater expenditure of water than electrolyte via skin, lungs, stool and urine. The water deficit in these infants is primarily intracellular.
- The majority of infants with this type of dehydration show varying degrees of depression of central nervous system varying from lethargy to coma. Convulsions are frequently observed, irritability, fever and hyperreflexia
- Dilute solutions of electrolyte are indicated in rehydration. Rapid adjustment, however, appears to accentuate the CNS disturbance. Rehydration is best carried out slowly over a 36-48 hour.

Hypernatremic dehydration

Major danger due to condition:

Brain hemorrhage...shrinkage of brain leading to tearing of vessels

Major danger due to treatment:

Brain edema due to movement of water into the brain cells. Occurs if treatment is too rapid

Hyponatremic Dehydration

- Sodium loss > Water loss
- Na <130mmol/L
- Water shifts from ECF to ICF
- Child appears relatively more ill
- Less intravascular volume
- More clinical signs
- Cerebral edema
- Seizure and Coma with Na <120

Hyponatremic dehydration

Correction

- Must again be performed slowly unless seizure are present(hypertonic saline 3% 4ml/kg)
- Rapid correction of chronic hyponatremia thought to contribute to :
  - Central Pontine Myelinolysis

Isonatremic dehydration

- By far the most common
- Equal losses of Na and Water
- Na = 130-150
- No significant change between fluid compartments
- No need to correct slowly

MANAGEMENT OF DEHYDRATION

-Replace Phase 1: Acute Resuscitation :

- *Give Lactated Ringer OR Normal Saline 20 ml/kg IV over 30 minutes.*
- *May repeat bolus until circulation stable*

-Calculate 24 hour maintenance requirements

- *Formula:*
  - *First 10 kg: (100 cc/kg/24 hours)*
  - *Second 10 kg: (50 cc/kg/24 hours)*
  - *Remainder: (20 cc/kg/24 hours)*

Example: *35 Kilogram Child*

- *Daily: 1000 cc + 500 cc + 300 cc = 1800 cc/day*

-Calculate Deficit:

Body Wt × %of dehydration

MANAGEMENT Continue ---------

-Calculate remaining deficit:

- *Substract fluid resuscitation given in Phase 1*

-Calculate Replacement over 24 hours:

- *First 8 hours: 50% Deficit + Maintenance*
- *Next 16 hours: 50% Deficit + Maintenance*

Determine Serum Sodium Concentration

- *Hypertonic Dehydration (Serum Sodium > 150)*
- *Isotonic Dehydration*
- *Hypotonic Dehydration (Serum Sodium < 130)*

Add Potassium to Intravenous Fluids after patient voids urine

- *Potassium source*
  - *Potassium Chloride*
  - *Potassium Acetate for Metabolic Acidosis*
- *Potassium dosing*
  - *Weight <10 kilograms: 10 meq KCl /liter*
  - *Weight >10 Kilograms: 20 meq KCl /liter*

Other agents used in acute diarrhea

- Probiotics reduce the duration of diarrhea
- Zink therapy
- Ondasetron for vomiting
- Antibiotic:according to the culture and sensitivity