ACUTE DIARRHEA

Definition:

- **Diarrhea is defined as a change in consistency and frequency of stools, i.e. liquid or watery stools, that occur >3 times a day.**
- **In the vast majority of cases, these acute episodes subside within 7 days. If there is associated blood in stools, it is termed dysentery.**
- **Acute diarrhea may persist for more than 2weeks in 5 -15 % cases , which is labelled as persistent diarrhea.**

- **The global annual burden of diarrhea is huge, affecting 1.7 billion cases every year and accounting for ~11% of all childhood deaths world-wide.**
- **One of the important causes of under 5 mortalities.**
- **The two most important consequences of diarrhea in children are malnutrition and dehydration.**

- ***ETIOLOGY***
- **Causative agents of acute diarrhea can be identified nearly 70-80% episodes.**
- **Rotavirus remains the leading cause of severe, dehydrating gastroenteritis worldwide.**
- **In India , rotavirus and enterotoxigenic E. coli account for nearly half of the diarrheal episodes among children.**
- **Cholera accounts for 5 -10% cases ; it is endemic in some parts and may occur in outbreaks.**

- **Apart from enterotoxin producing E. coli (ETEC), which accounts for nearly 20% of childhood diarrhea, enteroinvasive E.coli (EIEC) and enterohemorrhagic E. coli (EHEC) can cause dysentery.**
- **Shigella and salmonella species are isolated in 3-7% of childhood diarrhea.**

<u>Other causes</u>

- **Intestinal infections**
- **Drugs**
- **Food allergies**
- **Systemic infections**
- **Surgical conditions.**

Causes of Acute diarrhea

Bacterial

- Escherichia coli: Enterotoxigenic, enteropathogenic, entero-invasive*, enterohemorrhagic* and enteroaggregative types
- Shigella*: S. sonnei, S. flexneri, S. boydii and S. dysenteriae
- Vibrio cholerae serogroups 01 and 0139
- Salmonella*: Chiefly S. typhi and S. paratyphi A, B or C
- Campylobacter species*

Viral

Rotavirus

Human caliciviruses: Norovirus spp.; Sapovirus spp.

Enteric adenoviruses serotypes 40 and 41

Others: Astroviruses, coronaviruses, cytomegalovirus, picornavirus

Parasitic

Giardia lamblia
Cryptosporidium parvum
Entamoeba histolytica*
Cyclospora cayetanensis
Isospora belli

Risk factors

- poor sanitation and personal hygiene,
- non-availability of safe drinking water,
- unsafe food preparation practices ,
- low rates of breastfeeding and immunization.
- Young (<2 years) and malnourished children are more susceptible to AD.
- Other risk factors for prolonged and recurrent episodes of diarrhoea include

1. hypo- or achlorhydria (due to Helicobacter pylori infection or therapy with proton pump inhibitors)
2. immunodeficiency (selective Ig A deficiency, HIV, etc.).

Pathogenesis & Clinical features

Pathogenesis

Approx. 60% of child's body weight is water present in two compartments –extracellular fluid compartment & intracellular fluid compartment.

In 50% cases, conc. of sodium in plasma remains normal (140mEq/L) ;in other 45-50% cases, excessive sodium is lost in stools leading to relative decline in serum sodium (hyponatremia)& a fall in ECF osmolality.

- It Causes movement of water from ECF to ICF compartment, causing further shrinkage of already reduced extracellular compartment volume in hyponatremic dehydration .

Clinical features

- In hyponatremic dehydration ,water moves from inside the cells to ECF compartment due to increased osmolality of ECF & therefore masks loss of skin turgor.

  ** skin appears soggy, doughy or leathery.

As ECF compartment is depleted , blood volume is reduced which results in weak ,thready pulse ,low blood pressure & cold extremities.

- Diarrheal stools contain large amounts of potassium. Therefore, serum potassium invariably falls, if diarrhea persists for more than few days.

* Affected children presents with abdominal distension, paralytic ileum & muscle hypotonia

Electrocardiogram may show ST depression & flat T waves.

- The child is thirsty and slightly irritable in early & mild case of diarrhea. As diarrhea continues & dehydration worsens, the child becomes more irritable with depressed fontanelle ,sunken eyes & dry tongue.

- As the acidosis worsens, breathing becomes deep & rapid.

- In extreme cases, the child appears moribund with weak & thready pulse,low blood pressure and oliguria.

Assessment of child with acute Diarrhea

- **GOALS OF ASSESSMENT**

- DETERMINE THE TYPE OF DIARRHEA

- LOOK FOR DEHYDRATION

- ASSESS FOR MALNUTRITION

History

- Onset of diarrhea
- Blood in stools
- Number of episodes of vomiting
- Presence of fever, cough
- Type and amount of food taken during illness
- Drugs
- Immunization history

Examination

	No dehydration.	Some dehydration.	Severe dehydration
Look at –			
Condition	Well alert	Restless, irritable	Lethargic, floppy unconscious
Eyes	Normal	Sunken	Very sunken
Tears	present	Absent	Absent
Mouth and Tongue	Moist	Dry	Very dry
Thirst	drinks normally	Thirsty drinks eagerly.	Drinks poorly
Feel –			
Skin pinch	Goes back quickly	Goes back slowly.	Goes back very slowly

Laboratory investigations of ACUTE DIARRHEA

- *Laboratory investigations for acute diarrhea typically include stool analysis to identify the causative organism, such as bacteria, viruses, or parasites.*

- *This may involve testing for pathogens like*
- *V. Cholera, Giardiasis, Salmonella, Shigella, Campylobacter, or rotavirus*

- **Electrolytes levels**

  * Sodium levels and potassium levels are Estimated

  → The normal serum sodium levels in the paediatric age group are: 135-145mEq /L

  Hyponatremia – Sodium levels less than 130mEq/L
  Hypernatremia – Sodium levels more than 150mEq/L

  → The normal serum potassium levels in the pediatric age group are: 3.5-5.5 mEq/L

  Hypokalemia – Potassium levels less than 3.5mEq/L
  Hyperkalemia – Potassium levels more than 6.0mEq/L

Other investigations:-

- Hemogram

  Hemoglobin (Hb) ,Total Leukocyte Count (TLC), Differential Leukocyte Count (DLC)

- Stool pH

  It can be estimated by nitrazine paper

  Method – Dip the pH paper into the stool sample, making sure to wet the paper evenly. Compare the resulting color to the reference chart provided with the pH paper to determine the pH value.

  Normal pH is 7.0-8.0

- **Bicarbonate levels** -Normal serum bicarbonate levels 18-22mEq/L

→ Metabolic acidosis – bicarbonate levels less than 18mEq/L

→Metabolic alkalosis – Bicarbonate levels more than 22mEq/L

These tests are performed only if the child has pallor, laboured breathing, altered sensorium, seizures, oliguria.

Principles of Management

- Rehhydration and maintaining hydration
- Proper feeding
- Oral supplementation of zinc
- Early recognition of danger signs and treatment of complication

→ Danger signs like diarrhea for more than 3 days

Increased volume or frequency of stools

Repeated vomiting, increased thirst, decreased urine output

Refusal to feed, fever or blood in stools.

Table 11.9: Composition of WHO recommended ORS

Constituent	*g/l*	*Osmole or ion*	*mmol/l*
Sodium chloride	2.6	Sodium	75
Glucose, anhydrous	13.5	Chloride	65
Potassium chloride	1.5	Glucose, anhydrous	75
Trisodium citrate, dihydrate	2.9	Potassium	20
		Citrate	10
Total osmolarity			245

Other home made fluids

- Salted rice water
- Yogurt drink
- Vegetable or chicken soup with salt

Treatment plan A – No Dehydration(<50ml/kg fluid loss)

The mother may be given WHO ORS for use at home.

Danger signs requiring medical attention
are those of continuing diarrhea beyond 3 days, increased volume/ frequency of stools, repeated vomiting, increasing thirst, refusal to feed, fever or blood in stools.

Table 11.11: Oral rehydration therapy to prevent dehydration (Plan A)

Age	*Amount of ORS or other culturally appropriate ORT fluids to give after each loose stool*	*Amount of ORS to provide for use at home*
< 24 mo	50–100 ml	500 ml/day
2–10 yr	100–200 ml	1000 ml/day
>10 yr	Ad lib	2000 ml/day

Explain use of ORS, i.e. the amount to be given, how to mix
Give a teaspoonful every 1–2 min for a child under 2 yr
Give frequent sips from a cup for an older child
If the child vomits, wait for 10 min. Then give the solution more slowly (for example, a spoonful every 2–3 min)
If diarrhea continues after the ORS packets are used up, tell the mother to give other fluids as described above or return for more ORS

Treatment plan B– Some dehydration (50-100ml fluid loss)

1.Provision of normal daily fluid requirements:

Up to 10 kg = 100 mL/kg, 10-20 kg = 50 mL/kg, >20 kg=20ml/kg

2.Rehydration to correct the existing water or electrolyte deficits:
Calculated as 75 mL/kg of ORS, to be given over 4 hours. If, after 4 hours, the child still has some dehydration,
then another treatment with ORS (as in rehydration therapy) is to be given.
This therapy is effective in 95% cases

3.Maintenance fluid therapy to replace ongoing losses to prevent recurrings of dehydration

Table 11.12: Guidelines for treating patients with some dehydration (Plan B)

Age	*<4 mo*	*4–11 mo*	*12–23 mo*	*2–4 yr*	*5–14 yr*	*≥15 yr*
Weight	< 5 kg	5–8 kg	8–11 kg	11–16 kg	16–20 kg	>30 kg
ORS, ml	200–400	400–600	600–800	800–1200	1200–2200	>2200
Number of glasses	1–2	2–3	3–4	4–6	6–11	12–20

The approximate amount of ORS required (in ml) can also be calculated by multiplying the patient's weight (in kg) times 75. When body weight is not known, the approximate amount of ORS solution to give in the first 4 hr is given according to age

For infants under-6 months who are not breastfed, also give 100–200 ml clean water during this period

Encourage breastfeeding

Treatment plan C - Severe dehydration(>100ml/kg fluid loss)

1. Intravenous fluids should be started immediately using

Ringer lactate with 5% dextrose (Normal saline or plain

ringer lactate may be used as an alternative)

- A total of 100 ml/kg of fluid is given,

  over 6 hr in children <12 months and

  over 3 hr in children >12 months.

- If IV fluids cannot be given (for reasons of access, logistic availability or during transport),nasogastric feeding is given at 20 ml/kg/hr for 6 hr (total 120 ml/kg)

- ORS solution should be started simultaneously if the child can take orally.

Age	30 ml/kg	70 ml/kg
<12 mo	1 hr*	5 hr
>12 mo	30 min*	2 ½ hr

- **The child should be reassessed every 15-30 min for pulses and hydration status after the first bolus of 100 ml/kg of IV fluid.**

- Management following the first bolus of intravenous hydration is as follows…….

Persistence of severe dehydration – Intravenous infusion is repeated.

Hydration is improved but some dehydration is present.
IV fluids are discontinued; ORS is administered over 4hrs according to Plan B

There is no dehydration. IV fluids are discontinued; Treatment plan A is followed.

Nutritional Management of Diarrhea

Children with severe malnutrition (marasmus or kwashiorkor) are at an increased risk of developing both acute diarrhea and its complications, such as severe systemic infection, dehydration, heart failure, vitamin and mineral deficiencies.

Feeding should not be restricted in such patients as this aggravates complications and increases morbidity and mortality.

Following are the recommendations on dietary management of acute diarrhea:

i. In exclusively breastfed infants, breastfeeding should continue as it helps in better weight gain and decreases the risk of persistent diarrhea.

ii. Optimally energy dense foods with the least bulk, should be offered in small quantities but frequently (every 2-3 hr).

iii. Foods with high fiber content, e.g. Coarse fruits and vegetables should be avoided.

iv. Staple foods do not provide optimal calories per unit weight and these should be enriched with fat or oil and sugar, e.g. khichri with oil, rice with milk or curd and sugar, mashed banana with milk or curd, mashed potatoes with oil and lentil.

v. **In nonbreastfed infants**, cow or buffalo milk can be given undiluted after correction of dehydration together with semisolid foods. Milk should not be diluted with water during any phase of acute diarrhea.

Alternatively, milk cereal mixtures, e.g. dalia, sago or milk-rice mixture, are preferable.

vi. **During recovery**, an intake of at least 125% of recommended dietary allowances should be attempted with nutrient dense foods; this should continue until the child reaches preillness weight and ideally until the child achieves a normal nutritional status.

ZINC SUPPLEMENTATION

- **Zinc supplementation is now part of the standard care along with ORS**

- **It is helpful in decreasing severity and duration of diarrhea and the risk of persistent diarrhoea**

- **It can significantly reduce all-cause mortality by 46% and hospital admission by 23%**

- **Zinc is supplemented as sulfate, acetate or gluconate**

- **a dose of 20 mg of elemental zinc per day for children >6 months for 14 days.**

- **a dose of 10 mg of elemental zine per day for children <6 months for 14 days**

Symptomatic Treatment

Vomiting:

- **occasional vomit in a child with acute diarrhea does not need antiemetics.**

- **If vomiting is severe or recurrent and interferes with ORS intake, then a single dose of oral Ondansetron (0.15 mg/kg/dose) should be given.**

- **Preferably wait for 45-60 minutes before restarting ORT**

Paralytic ileum:

- **Paralytic ileus should be suspected, if bowel sounds are absent and abdomen is distended.**

- **It is due to**
    1. **Hypokalemia**
    2. **Intake of anti motility drugs**
    3. **Necrotizing entrocolitis**
    4. **Septicemie**

- **It require IV fluids, nasogastric aspiration, correction of hypokalemia and no oral feeding.**

- **Potassium chloride (30-40 mEq/L) should be administered intravenously with parenteral fluids provided the child is passing urine**

Convulsions:

- **It’s is due to**
    1. **Hypo or hypernatremia**
    2. **Hypoglycaemia**
    3. **Hypocalemia**
    4. **Encephalitis**
    5. **Febrile seizure**
- **The management depends on etiology**

Drug therapy

Anti motility agents:

- **Drugs like diphenoxylate hydrochloride and loperamide should not be used in children with diarrhoea**

- **These reduces gut motility give bacteria time to grow and causes paralytic ileus and sepsis**

Antisecretory agents:

- **Racecadotril exerts it's anti diarrhoea effects by inhibiting intestinal enkephalinase**

Probiotics:

- **Lactobacillus rhamanosus GG >10^10 CFU/day or Saccharomyces boulardii 250-750 mg/ day for 5-7 days can be used as an adjuvant therapy**

Antimicrobial

:

- Most episodes of diarrhea are self-limiting and do not require any antibiotic therapy

- Drugs like metronidazole,ciprofloxcin,cefixime,ceftriaxone are used based on the bacteri

PREVENTION OF DIARRHEA AND MALNUTRITION

1-: PROPER NUTRITION

2-: ADEQUATE SENITATION

3-: VACCINATION

Proper nutrition

1-:Breast milk provide protection against diarrheal Illness promoting growth and development of infant.

2-: Supplementary feeding with energy rich food containing adequate amount of nutrition should be introduced by 6 month of age ,without stopping Breastfeeding.

Adequate sanitation

3 ‘Cs’ –

C- clean hands

C- clean container

C- Clean environment

Vaccination-:

Vaccination against the rota virus

Thank you for listening