

DIARRHOEA AND DEHYDRATION (Gastroenteritis in Infancy & Childhood)

Dept. of Pediatrics

Diarrhoea in the 21st Century

- 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)

Acute Diarrhoea

- Definition

Increased frequency and water content of stools than is normal for the individual

Usually: > 3 stools per day

- Descriptive

Watery, mucoid, dysenteric

- Pathogenetic:

Infective, non-infective



- What is diarrhoea?
 - Passage of 3 or more loose, liquid or watery stools in a day
- PSEUDODIARRHOEA: Small volume of stool frequently (IBS)

Chronic diarrhoea

Diarrhoea can be categorized as:

- Acute: less than 7 - 10 days
- Persistent: More than 7 - 10 days
- Chronic: More than 14 - 21 days

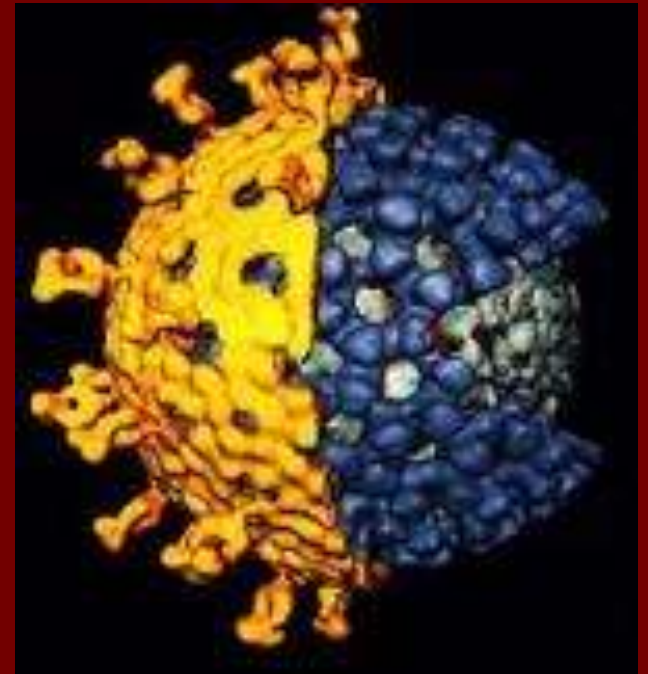
(Persistent diarrhoea often a prolonged course of acute insult - different management)

AGE

- Very common problem in Paediatrics
- Causes Diarrhoea, vomiting & fever
- Usually viral
 - Rotavirus, Adenovirus, Enterovirus
- Bacterial
 - E-coli, Shigella, Salmonella, Yersinia, Campylobacter
- Parasitic
 - Giardia, Entamoeba

ROTA VIRUS

- Usually cause explosive, watery diarrhoea
- Typically last only 48-72hrs
- Usually no blood and pus in stool



Rotavirus

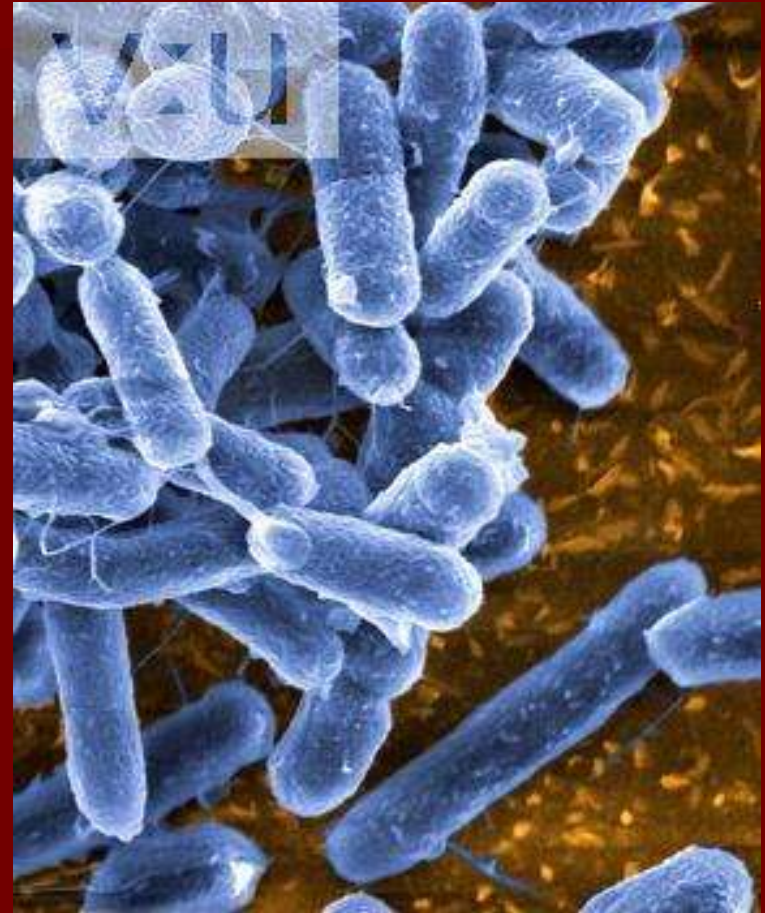
➤ Bacterial enterocolitis

- Sign of inflammation – blood or pus in stool, fever



E. Coli bacteria

- Contaminated food or water
- Usually affect small kids

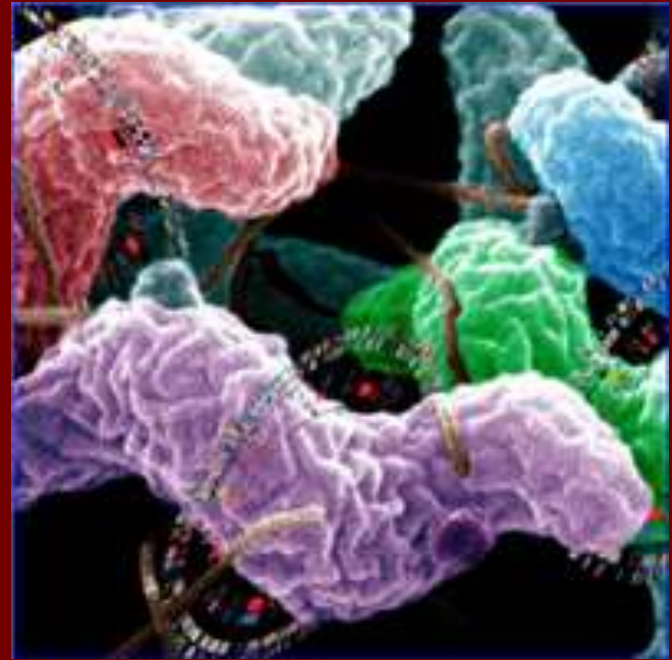


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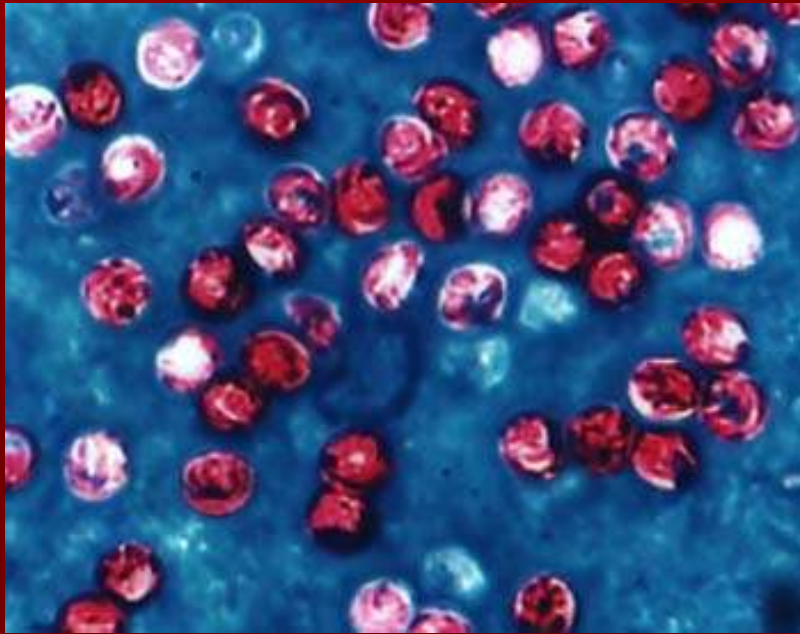


Shigella bacteria



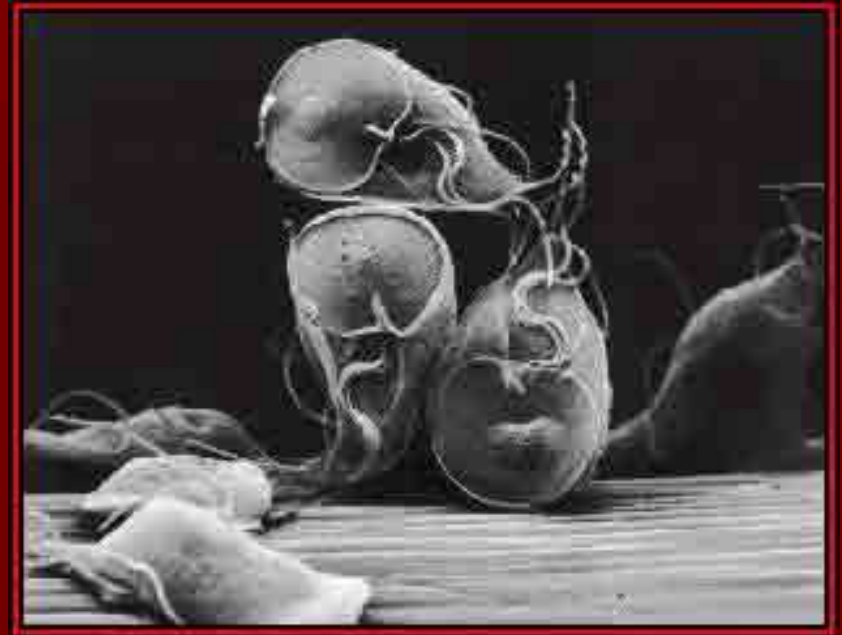
Campylobacter
bacteria

➤ Parasites



Cryptosporidium

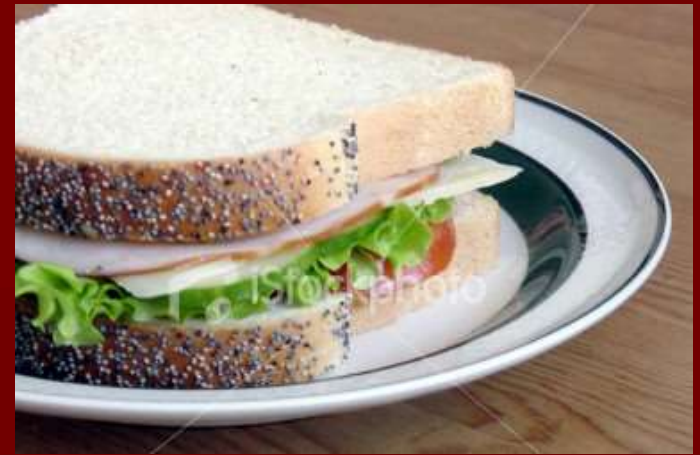
- in contaminated water – can survive chlorination



Giardia lamblia

- in contaminated water
- Usually not associated with inflammation

- Food Poisoning



Staphylococcus aureus

- Produces toxins in food before it is eaten
- Usually food contaminated left unrefrigerated overnight

Pathogenesis of Diarrhoea

Depends on pathogen

■ VIRUS DIARRHOEA (eg Rotavirus)

Effect on villus structure (enterocytes)
and function (cells shed→Imm Cell→Imm
cells Enzyme disaccharidase

Significant effect on digestion and
absorption

Secretion-absorption imbalance

Pathogenesis of Bacterial Diarrhoea

■ ***without mucosal injury***

mediated by:

Enterotoxins -Vibrio Ch, E Coli -↑ Int Secretions.

Adhesins- EPEC –Mucosal damage -↓ Recovery

■ ***with mucosal injury***

mediated by:

Adhesins

Invasins– Shigella, EIEC(O124,O164)

Cytotoxins- Clostridium_Direct effect on Enterocytes.

What is Gastroenteritis?

- Damage to gut mucosa
- Disturbance of balance between mechanisms controlling secretion & absorption
- Net effect = Diarrhoea
- Most cases self limiting with full recovery
- BUT small proportion →
 - Severe dehydration +
 - Electrolyte abnormalities
 - Shock, cerebral oedema +
 - Death

Chronic diarrhoea

- With failure to thrive and excessive stool water losses

Small intestinal mucosal injury

- With failure to thrive but without excessive stool water losses

Malabsorption syndromes

- Without failure to thrive

Motility disorder

Small intestinal mucosal injury

- Initiating acute insult - infection
- Contributing malnutrition, young age, feeding problem
- Acute diarrhoea does not stop
- Leads to malnutrition
- Aggravation by unmodified food
- Immunological consequences
- Contributes big percentage of deaths from diarrhoeal disease

Mechanisms of acute diarrhoea

- Osmotic
 - eg Lactose intolerance
- Secretory
 - eg Cholera
- Mixed secretory-osmotic
 - eg Rotavirus
- Mucosal inflammation
 - eg Invasive bacteria
- Motility disturbance

C/F

- Nausea, Vomiting, Abd pain, .
- Severe in young/malnourished.
- Blood-Shigella, Salm, Cam B, E. Coli O157
- EC O157- HUS, RF.
- DD-Other Medical cond/Metab/Surg Dis.

Review of Dehydration

- Weight changes are still the most accurate
- ***NO DEHYDRATION- Well Alert ,Eyes-N,Tears- Present, Mouthand Tongue-Moist, Thirst- Not Thirsty, Skin pinch- Goes back QUICKLY***
- **5% SOME DEHYDRATION** (*oral/nasogatric, breast/gastrolyte, consider IV*)
 - Restless irritable, Eyes and Fontanelle-SUNKEN /Tears –Absent/ Mouth, Tongue—Dry/Thirst- Drinks Eagerly,↓ Urine output.
 - Skin Pinch goes back Slowly.
 - Tachycardia (mild)

DEHYDRATION Contd

- SEVERE- 10 % +
- Lethargic/Uncons.
- Eyes-Very sunken ,Dry.
- Tears- Absent.
- Thirst- Drinks Poorly.
- Skin Pinch- Goes back Very slowly (>2 sec)

Dietetic:

- **Under feeding**
- **Over feeding (Excess of fat and carbohydrate)**
- **Food allergy**
- **Intolerance**
- **Food poisoning**

Infections: (Parenteral)

- **Upper respiratory tract infection**
- **Upper urinary tract infection**
- **Any other**

Others:

- **Psychogenic**
- **Metabolic disorders like hyperthyroidism**

Clinical approach to diagnosis

In rotavirus diarrhoea

- Vomiting is early feature
- Mild to moderate fever

Norwalk virus

- Occurs in pre-school children

E.coli / V. cholerae

- Stool are large and watery
- Fecal matter appears curdy.
- Vomiting is common

Shigella

- **Dysentery – stool with mucus & blood**
- **Abdominal cramps and tenesmus**
- **Fever**

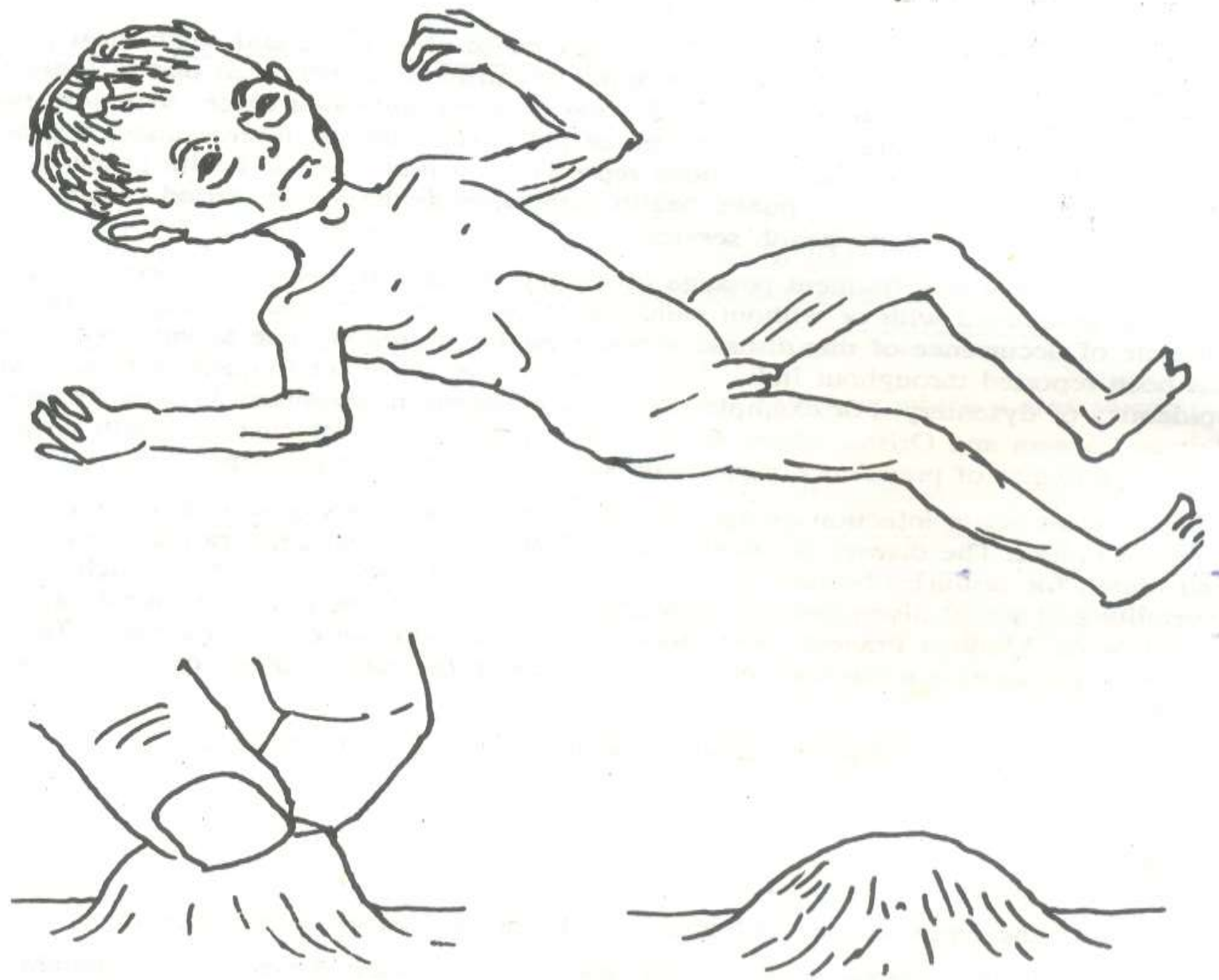
Salmonella / Campylobacter / Shigella / E.coli. (Invasive type)

- **Small amount of blood**

Staphylococci / Candida albicans / Clostridium:

- **Who had received prolonged treatment / with broad spectrum antibiotics.**

- ASSESSMENT OF HYDRATION STATUS
- Clinically categorized it into
- Mild, moderate, severe dehydration
- **Mild dehydration signs**
Thirst, dry mouth, less urine or dark urine and irritable.
- **Moderate dehydration**
Dry mouth, sunken eyes, less tears, loss of skin turgo, decreased urine output, less active and quite and cold extremities.
- **Severe dehydration**
No urine output more than 6 hours, deep sunken eyes, sunken AF in infant, dry sticky mouth, dry lips, cold extremities, baby is quite, pale with rapid heart rate and rapid and deep breathing, this is an emergency.



Differential Diagnosis

■ Think of other options:

- Abdo distension
 - Bile stained vomiting
 - Fever $> 39^{\circ}\text{C}$
 - Vomiting, but NO Diarrhea
 - Blood in Urine/stool
- } Bowel obstruction
strangulated hernia*
- Sepsis, Meningitis,
Dysentery, UTI*
- UTI, Meningitis,
DKA, raised
intracranial pressure*
- IBD, HUS, Dysentery*

INV

- Haemogram- with ps
- CRP
- Stool R/E- Pus Cells, Fat., cholera test
- Stool Cultures.
- Electrolytes.
- Sugar
- Urine routine, culture

Principles of Fluid Management

- Enteral route preferable to parenteral route for mild/moderate dehydration
- Treatment of mild dehydration
- Oral rehydration therapy
- Continue Breast milk
- Aim
 - 1 ml/kg every 10 mins or 5 ml/kg very hour
- For moderate or severe dehydration IV access & fluids required

Management.

- Treat according to the severity of dehydration.
- Mild dehydration (3 to 5 % losses)
In infant ORS plus breastfeeding
In children ORS plus oral fluids plus soft diet.
- Moderate Dehydration (5 to 9 % losses)
IV fluids plus ORS
- Severe Dehydration (10 % loss)
Treat shock (10 to 20 ml per kg of NS)
Isotonic IV fluids
Later on start with ORS

Principles of Fluid Management

■ Rehydration

- This can be done slowly usually over 24 hrs
- If hyponatremic aim for 48 hrs
- **AVOID RAPID FLUID SHIFTS !!!**

■ Careful regular assessment is the key

3 Fluid Types

1. Maintenance
2. Rehydration
3. Ongoing losses

2. Rehydration

- Depends on fluid deficit
- 5% = 50 mls/kg/day (over 24 H correction)
- 10 % = 100 mls/kg/day (over 48 H)
- Same 10kg infant 5%
 - = 50 mls x 10 x 24 hrs
 - = 500 mls/day rehydration fluid

3. Ongoing Losses

- Not part of guidelines
- But in profuse, watery diarrhoea add 10-20 mls/kg/Stool to account for regular losses.

Medications

- No indications for
 - Anti-vomiting
 - Anti-diarrheal
 - Anti-motility
- Antibiotics only for proven bacterial gastroenteritis

Pitfalls

- Watch the salt !!!
 - Evidence that SIADH occurs with gastroenteritis
 - Changes to serum Na^+ can lead to cerebral oedema, seizures & death
- Do not forget the Potassium
 - Once urine passed → add 3 mmol/kg/day
 - May require up to 5mmol/kg/day if hypokalaemic
 - → Add 10 mmol KCl / 500 mls fluid

Pitfalls (continued)

- Be Sweet → add Dextrose
 - Particularly in younger children
 - New evidence 2.5% Dex should be sufficient
- Milk (if tolerated) is better than intravenous fluid for the patient and the gut mucosa

Tt

- TREATMENT PLAN A
- 4 Rules of home treatment
- 1. Give extra fluid-
- Breastfed frequently,
- Give one or more : ORS solution, food based fluids (such as soup, rice water and yoghurt drinks), clean water
- Teach the mother how to mix and give ORS. Give the mother 2 packets of ORS to use at home.
- Show the mother how much fluid to give (After each loose stool and between them) in addition to the usual fluid intake:
- Up to 2 years : 50-100 ml
- 2 years or more: 100-200 ml
- > 10 years: as much as wanted

- Tell the mother to:
- Give frequent small sips from cup
- In case of vomiting: Wait 10 min.then continue but slowly,
- Continue giving extra fluids until the diarrhoea stops
- 2.Give Zinc Supplements:
- Tell the mother how much zinc to give:
- < 6 months (dose 10 mg/day): x 14 days
- > 6 months (dose 20 mg/day): x 14 days
- 3. Continue feeding

- TREATMENT PLAN B
- Determine amount of ORS over 4 hour period: 75 ml/kg body
- If the child wants more ORS then give more
- For infants < 6 months (not breastfed):
- give 100-200 ml clean water also
- Age (months) < 4 4-12 12-24 24-60 Weight (kg) <6 6-<10
10-<12 12-19 Amount (ml) 200-400 400-700 700-900 900-1400
- :
- Give frequent small sips from cup
- In case of vomiting: Wait 10 min.then continue but slowly,
- Continue giving extra fluids until the diarrhoea stops
- After 4 hours
- Reassess as per assessment chart and treat accordingly
- (Plan A,B or C)

TREATMENT PLAN C

- If the child can drink, give ORS orally while the drip is set up.

Reassess the child every 1-2 hours.

- If hydration status is not improving give the IV drip more rapidly
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- Also give ORS (5 ml/kg/hour) as soon as the child can drink.
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- Reassess an infant after 6 hours and child after 3 hours:
- < 12 Mths-- 30ml/kg In 01 Hr(RL/NS) Then give 70 ml/kg in 5 Hrs
- 12 months - 5 years-- 30 min. and 2 ½ hours*

■ Composition of WHO -ORS

21 gms packing		Mmol / ltrs
Sodium chloride	2.6 gm	75
Potassium chloride	1.5 gm	20
Sodium citrate	2.9 gm	10
Chloride		65
Dextrose	13.5 gm	75
Total osmolarity		245

- Home made ORS
- 1 tsp table salt + 4 heaped tsp sugar
- in 1 litre of water
- SUPER ORS
- Amino acid based ORS
- Amino acids (Alanine, Glycine co-transport the Na⁺) are used
- in place of glucose
- Powder of boiled rice (50 mg/L) can be used in place of amino acids
- Decrease purging rates and improve absorption
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- DRUGS IN DIARRHOEA
- Antibiotics in Dysentery
- In Dysentery: Cotrimoxazole
- If cholera – Give Doxy
- Look for trophozoites of E.Histolytica in stool Complete the 5 days treatment
- If does not get better then
Refer to hospital Treat with Metronidazole

- NUTRITIONAL MANAGEMENT OF DIARRHOEA
- 1.Continue breastfeeding
- 2.Energy dense foods should be given:
Khichdi , rice water, curd, mashed banana, mashed potatoes and lentils
- 3.Foods with high fibre content should be avoided
- 4. Continue with ORS

- National diarrhoea diseases control programme
- 1.Short term: Appropriate clinical management -ORT -Appropriate feeding
- 2.Long term a. Better MCH practices - Maternal nutrition -Child nutrition: BF, proper weaning, supplementary feeding

- b. Preventive strategies –
 - Sanitation
 - Immunization
 - Food Hygiene: Boil it, cook it properly
- c. Prevention and control of diarrhoeal epidemics -Strengthening of epidemiological surveillance