

# **Childhood Diarrhea**

## **(Gastro-enteritis)**

## [2] Seasonality

- Sporadic cases all over the year.
- Peak of morbidity & mortality in summer & early fall (summer diarrhea)
- Small peak during winter: ARI associated with 2ry diarrhea.

# [3] The infectious cycle

(The natural history of the disease)

**Etiology:**

It is multi-factorial

## (1) 1ry infection of GIT:

Viral	Bacterial	Protozoal
<ul style="list-style-type: none"><li>• Rotavirus (70%)</li><li>• Enteroviruses</li><li>• Adenoviruses</li><li>• Hepatitis A &amp; E</li></ul>	<ul style="list-style-type: none"><li>• E. Coli (ETEC, EHEC, EPEC, EIEC)</li><li>• Shigella, salmonella,</li><li>• S. aureus,</li><li>• Others</li></ul>	Giardia, Entamebia, B. coli

## (2) 2ry diarrhea: as a complication of other diseases:

- Viral diseases: measles, rubella, mumps, chickenpox
- Bacterial infections: ARI, tonsillitis,...

**What are the causes of non-infectious diarrhea?**

### **Source of infection (reservoir):**

1. Human: (main source): cases & carriers.
2. Animals: (in some infection) e.g. salmonella, balantidium coli.

### **Exit:**

With stool of infected person  $\pm$  vomitus

### **Period of communicability:**

As long as the organism is excreted in stool  
usually 2-3 weeks.



## Modes of transmission:

## Ingestion infection

- Contaminated
- 1. Water (with human excreta or sewage).
  - 2. Milk & milk products.
  - 3. Food (handling, flies, dust or polluted water)
  - 4. Bottles, teats & utensils used to prepare baby formulas & feeding.

## Incubation period:

From few hrs up to 2-4 days according to causative agent

## **Pathogenesis:**

<b>1- Invasive diarrhea</b>	invades intestinal mucosa e.g. salmonella, EHEC, EIEC.
<b>2- Secretory diarrhea</b>	enterotoxins stimulate secretions of epithelial cells e.g. ETEC, vibrio cholera, staph aureus.
<b>3- Osmotic diarrhea</b>	↓ disaccharidase enzymes → hydrolysis of disaccharides into monosaccharides in lumen → osmotic diarrhea.
<b>4- Others</b>	↑ motility, interference with absorption (malabsorption)

## Clinical picture:

### Mild cases

- **Fever**: no or mild.
- **Diarrhea**: mild (<5 times/day)
- usually no **vomiting**.
- **Dehydration**: no or insignificant
- **systemic manifestation**: no or mild
- **Self-limited within few days**

### Moderate & severe cases

- **Sudden onset, with fever.**
- **Irritability or apathy**, anorexia.
- **Abdominal** cramps & distension
- **Diarrhea**: Frequent (up to 20 or more)  $\pm$  blood & pus
- **Vomiting** usually appears later.



## Clinical types of diarrhea:

<b>Acute watery diarrhea:</b>	<ul style="list-style-type: none"><li>• Acute onset of frequent loose or watery stools without visible bl.</li><li>• Lasts for &lt; 14 days</li></ul>
<b>Chronic diarrhea:</b>	Last for > 14 days with remission & exacerbation
<b>Persistent diarrhea:</b>	Acute diarrhea that lasts for 14 days or more without remission & exacerbation.
<b>Dysentery:</b>	Diarrhea with visible blood in the stool



## Complications

1. **Dehydration** which is the major cause of mortality.
2. **Nutritional deficiency**: recurrent diarrhea predispose to PEM (interaction bet. Inf. & malnutrition) **Vicious circle.**
3. **↑ susceptibility to systemic infection**, esp. ARI.
4. **Cardiovascular, nervous & urinary complications.**

## Laboratory diagnosis:

- Acute disease is managed without waiting for investigation.
- Lab. diagnosis is of practical value for persistent or recurrent cases only
  1. Microscopic exam. of stools.
  2. Stool culture to isolate causative bacteria.
  3. Serologic testing for viral infection , esp. rotavirus.

# Prevention of childhood diarrhea

## General measures:

- 1- Sanitary clean environment: - safe water supply,
  - milk & food sanitation,
  - sanitary waste disposal &
  - fly control.
- 2- H. education of mothers: - BF & proper Weaning,
  - Food & milk sanitation,
  - use of ORS
- 3- H. promotion: adequate nutrition
- 4- Prevention & control of systemic infection (general & specific)

Specific measures: Rota viruses vaccines & measles vaccine

## A clinical syndrome:

1. Affects **GIT**
2. Has **different etiologies:** viruses, bacteria, etc.
3. Ch. by **diarrhea**
4. Usually associated with **vomiting & fever**



# Control measures for cases

**Aim:** Early case finding & proper ttt.

- Mild cases: outpatient care & continue ttt at home.
- Severe cases: hospitalization.

## Components of treatment :

- 1- Rehydration therapy.
- 2- Diet therapy.
- 3- Symptomatic treatment.
- 4- Supplementary treatment.
- 5- Treatment of underlying disease.
- 6- Chemotherapy.

# Case Assessment (history + clinical exam)

## How to assess a case of diarrhea for dehydration?

### (1) History:

1. Personal: name, age, sex, address.
2. Diarrhea: duration, frequency, consistency, blood.
3. Vomiting: duration, frequency, color
4. Urination: last time urine passed.
5. Thirst.
6. Other complaint: fever, cough, skin rash, ear problems.
7. Feeding & fluid intake: time, type, amount.
8. Previous ttt during this episode: ORS, drugs.
9. Vaccination history.

**(2) Weight:** To assess

1. degree of dehydration
2. amount of fluid required for initial rehydration.

(1 gm wt loss = 1 ml water loss)

**(3) Temperature:** Fever may be due to:

1. Infectious diarrhea.
2. Associated infection: otitis media, pneumonia.
3. Dehydration (disappear after rehydration).

**(4) Examination:** to detect:

1. Presence & severity of **dehydration**
2. **Associated conditions:** under nutrition, otitis media, pneumonia
3. **Complication:** ileal paralysis.



# Assessment of Dehydration

Features	Degree of Dehydration		
	Mild	Moderate	Severe
Weight loss	< 5%	5-9%	10% or more
General Condition	Well, alert	Restless, thirsty, irritable	Drowsy, cold extremities, lethargic
Pulse (N=110-120 beat/min)	Slightly ↑	↑, weak	↑, sometime impalpable
BP (N=90/60 mm Hg)	Normal	↓	↓, may be unrecordable
Resp. rate	Slightly ↑	↑↑	Deep, rapid
Urine output	Normal	↓	Markedly ↓



## Assessment of Dehydration



Features	Degree of Dehydration		
	Mild	Moderate	Severe
Eyes	Normal	Sunken	Very sunken, dry
Tears	Present	Absent	Absent
Anterior fontanelle	Normal	depressed	Very depressed
Mouth + tongue	Normal	dry	Very Dry, furred
Skin pinch goes back	quickly	slowly	very slowly
Treatment	Plan A ttt	Plan B ttt	Plan C ttt

# Treatment Plan A

**Aim: ttt of diarrhea at home to prevent dehydration & malnutrition**

**Food + Fluids + Follow up**

## **(1) Food: Continue Feeding**

- In breast fed child → continue breastfeeding.
- In non-breast fed child → give usual milk.

### **If child is 6 months or older:**

1. Give **starchy food** mixed with **vegetables, meat or fish**.
2. Add 1-2 teaspoonful of **vegetable oil** to each serving
3. Fresh **fruit juice** or mashed banana.

## How often & how much food:

### During diarrhea:

At least **6 meals / day**

Frequent, small feedings are tolerated better than less frequent, large ones

### After stoppage of diarrhea:

- **extra-meal for 2 weeks.**
- In malnourished child , extra meals is given until the child regain his normal weight-for-height.



## **(2) Fluids:**

1. ORS (oral rehydration solution)
2. Rice water.
3. Soup
4. Orange juice
5. Yoghurt.

### **Unsuitable fluids**

**Fluids which can cause osmotic diarrhea & hypernatraemia, e.g.:**

- soft drinks
- sweetened fruit drinks
- sweetened tea.

**Fluids with stimulant, diuretic or purgative effects, e.g.:**

- coffee
- some medicinal teas or infusions.



## How much fluid to give:

<b>General rule</b>	<b>Give as much fluid as the child or adult wants until diarrhea stops.</b>
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## As a guide, after each loose stool, give:

<b>children aged &lt; 2 years</b>	<b>50-100 ml of fluid</b>
<b>children aged 2-10 years</b>	<b>100-200 ml.</b>
<b>older children &amp; adults</b>	<b>as much fluid as they want</b>

### **(3) Follow up for the following symptoms:**

1. Repeated **vomiting**
2. Persistence of **fever**
3. Persistence of **diarrhea**.
4. Severe **thirst**
5. Poor **eating or drinking**
6. **Blood** in the stool; or
7. the child does not get better in **3 days**.

## Definition of diarrhea:

**Passage of 3 or more loose or watery stools in 24 hrs.**

**A single loose or watery stool containing blood.**

**In practice: diarrhea is an ↑ in stool frequency or liquidity that is considered abnormal by the mother.**

**ORS:** packets, each of 5.5 g, dissolved in 200 ml water

**WHO formula, each packet contains:**

<b>Sodium chloride</b>	<b>0.7 g</b>	<b>Replacement</b>
<b>Na. bicarbonate</b>	<b>0.5 g</b>	<b>correct acidosis</b>
<b>K. chloride</b>	<b>0.3 g</b>	<b>correct hypokalaemia</b>
<b>Glucose</b>	<b>4.0 g</b>	<b>Nutrient</b>



## How to give ORS solution:

- **Teach** a family member how to prepare & give ORS solution.
- **Use** a clean spoon or cup to give ORS infants & young children (feeding bottles should not be used).
- **For babies**, use a dropper or syringe (without the needle).
- **For children aged < 2 yrs** a teaspoonful every 1-2 mins
- Older children (& adults) may take sips directly from the cup.
- **Vomiting:**
  1. usually occurs during the 1<sup>st</sup> 2 hrs of ttt, esp. if child drink quickly.  
Rarely prevents successful ORT bed. most of the fluid is absorbed.  
After that vomiting usually stops.
  2. If child vomits: wait 5-10 mins & then give ORS solution again, but more slowly (e.g. a spoonful every 2-3 mins).

# Treatment Plan B

**Aim: ttt of dehydration within 4 hours**

(1) Food: as in plan A.

(2) Fluid: As plan A, except:

- **The amount of ORS** = 75 ml / kg body weight
- **If child vomit**: wait 10 mins, then continue ORS but at slower rate (a spoonful / 2-3 min).
- **If child eye lids becomes puffy**: stop ORS & give plain water or breast milk till puffiness is gone → give ORS as in plan A.



### **(3) Follow up for reassessment:**

**After 4 hours, reassess the child :**

**No signs of dehydration, consider the child fully rehydrated.**

- Skin pinch is normal.
- Thirst has subsided.
- urine is passed.
- Child becomes quiet, no longer irritable & often falls asleep.

**Child still has signs indicating some dehydration:**

- 1- continue ORT by **repeating ttt Plan B.**
- 2- start to offer food, milk & other fluids, in ttt Plan A,
- 3- continue to reassess the child frequently.

**If signs of severe dehydration: shift to ttt Plan C.**

# Treatment plan C

Aim: ttt of severe dehydration quickly in hospital to avoid death

## Steps:

- (1) Give Ringers Lactate Solution: 100 ml / kg (if not available use normal saline).
- (2) Reassess child every 1-2 hrs, if no improvement, give I.V. drip more rapidly.
- (3) Give ORS by mouth (5 ml /kg/hour) as soon as patient can drink.
- (4) Evaluate patient after 6 hrs in infants (3 hrs in older patients), then continue ttt according to appropriate plan (A, B or C).



### **Indications for I.V. Ringers Lactate therapy:**

- (1) Severe dehydration (plan C)
- (2) Failure of oral rehydration
- (3) Paralytic ileum
- (4) Unable to drink, as in coma.



### **Indications for giving ORS by nasogastric tube:**

- (1) Repeated vomiting.
- (2) Refusal of ORS or unable to drink.
- (3) Stool output exceeds ORS input.
- (4) Exhausted mother.

## Chemotherapy:

### Indications:

- (1) **infective diarrhea:** Shigella, vibrio
- (2) **Protozoal:** Giardia & entamebia
- (3) Any existing **systemic bacterial infection.**

Proper dosage, for short time (resistance, side effects).

## **Symptomatic treatment:**

### **(1) Fever:**

**No antipyretics,**

ORS is valuable (there is interaction bet. fever & dehydration),  
cold compresses with light cloths & ttt of any associated systemic inf.

### **(2) Diarrhea:**

diarrhea helps elimination of infection.

It is self-limited & improved by rehydration.

Avoid antidiarrheal, adsorbent (kaolin, pectin) & antimotility drugs.

### **(3) Vomiting:**

It is due to loss of electrolytes & acidosis. Slow intake of ORS improves vomiting. Avoid antiemetics.

**(4) Abdominal distension:** due to loss of potassium in stools or ileus.

# National Control of Diarrheal Disease Program (NCDDP), 1991

## Aim:

### (1) ↓ Morbidity

- ↓ spread of infection & ↓ incidence of diarrhea
- ↓ Incidence of persistent diarrhea
- Improve nutritional status

### (2) ↓ Mortality

### (3) ↓ Inappropriate use of antibiotics.



## Components:

1. **ORS:** production, packaging & distribution.
2. **Training on ORT** for doctors, pharmacists, nurses & mothers.
3. **Research related to ORT:** Clinical, social & economic.
4. **Promotion of the project nationally:** using TV, radio & other public media
5. **Integration into PHC network.**
6. **Evaluation.**

# Epidemiology of childhood diarrhea

(1) Public Health Significance

(2) Seasonality

(3) Its infectious cycle:

1. Etiology (= Agent)

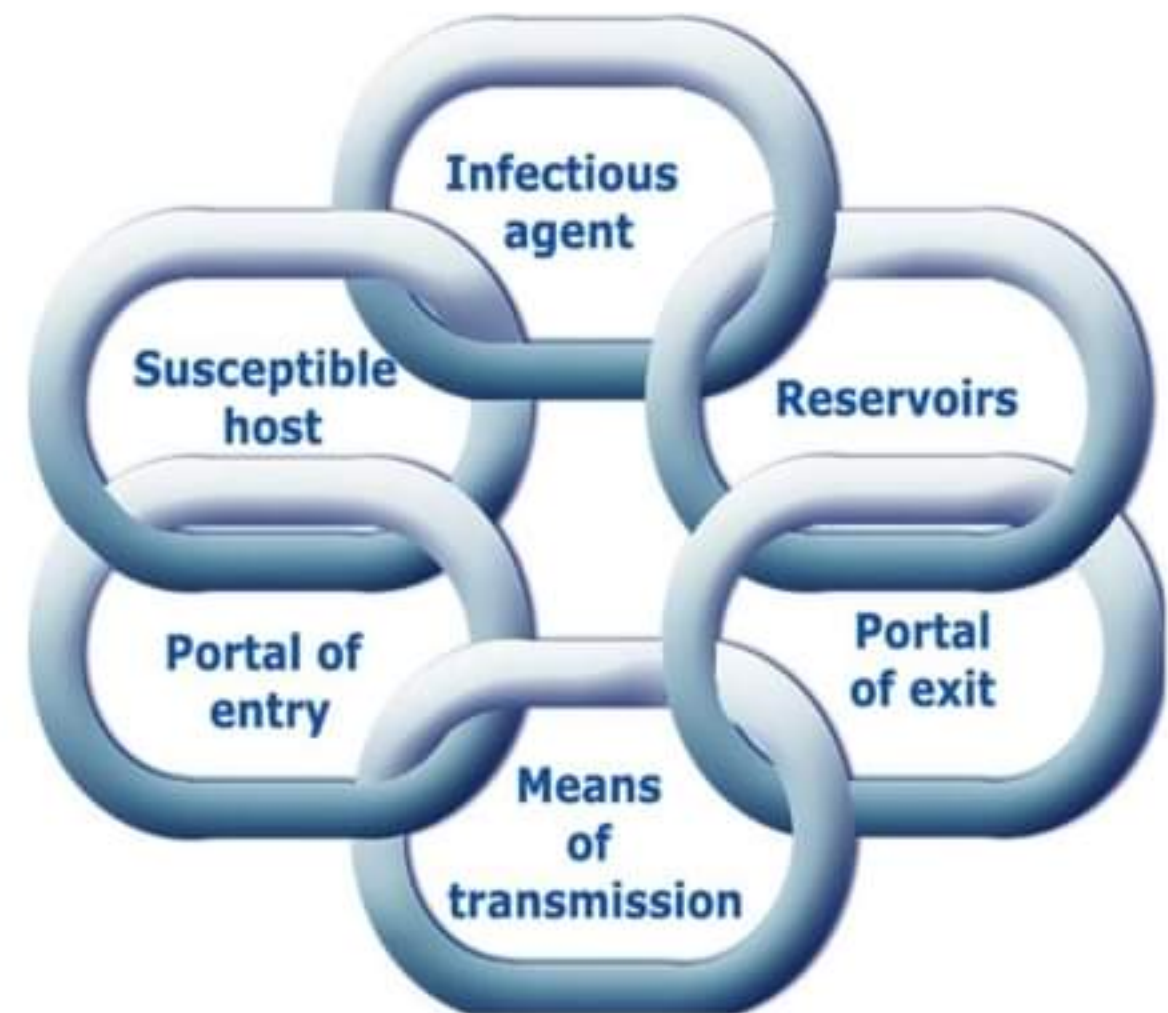
2. Source of infection:

- Type
- Portal of Exit
- Period of communicability

3- Modes of transmission

4- Susceptible Host

- Portal of entry
- Incubation period
- Pathogenesis
- Diagnosis: Clinical picture
  - + Complications
  - + Lab. diagnosis



**Key measures to prevent diarrhoea include: (WHO)**

1. **promotion of breast-feeding**; exclusive breastfeeding for the 1<sup>st</sup> 6 months of life
2. **Proper weaning**
3. **promoting personal & domestic hygiene**;
4. **Sanitary water supply**: access to safe drinking-water
5. **Improved sanitation**;
6. **use of oral rehydration solution** (ORS) in the community;
7. **vaccination** (rotavirus & other vaccines, e.g. measles).



# Objectives of International Control Project of Diarrheal illness

1-↓ mortality of diarrheal illness by short policies e.g. ORT, community education.

2-↓ morbidity in developing countries:

- Raising standards of environmental
- Health education for specific groups e.g. mothers

3-Availability of accessible health services:

- High immunization coverage.
- Proper infant & child care.
- Proper treatment of diseases complicated by diarrhea.
- Improving nutritional status of young age group.

4-Detection of source of infection & decrease reservoir.

# [1] Public Health Significance

Endemic **worldwide**

- (1) Its magnitude: (incidence & prevalence)
- (2) Its severity: (morbidity & mortality)
- (3) Its socio-economic burden:  
(individual, family, community, nation)
- (4) It can be prevented & controlled

## **(1) Its magnitude: (High incidence)**

**Globally: 2 billion cases of diarrhea / year (WHO).**

### **In developing countries**

**3.2 episodes/child/year**

not changed much since 1990s

### **In developed countries**

**1.4 episodes/child/year**

- 211–375 million cases/year
- > 900,000 hospital admissions
- 6000 deaths



**In developing countries (Egypt) it is a public Health problem because:**

- 1- Unsanitary environment (unsafe water & food, flies)**
- 2- Faulty traditional beliefs & health habits**
- 3- improper child H. care: artificial feeding & faulty feeding**
- 4- Lack of effective H. services**
- 5- Other H. hazards: (Malnutrition & Systemic infections, ARI).**

## (2) Its severity: (= morbidity & mortality)

esp. in children < 5 years of age → malnutrition & poor growth

### Global mortality due to diarrheal diseases:

Period	Estimated deaths / year
before 1980	4.8 million
1980–1990	3.3 million
1990–2000	2.6 million
2001–2005	1.8 million
2006–2010	1.5 million



### In Egypt:

It accounts for **25-30%** of mortality among children aged < 5 yrs

### **(3) Its economic burden:**

- 1- the use of Health resources (facilities, H. workers time)**
- 2- cost of ttt of diarrhea & malnutrition.**