Childhood Diarrhea

(Gastro-enteritis)

A clinical syndrome:

1. Affects GIT

2. Has different etiologies: viruses, bacteria, etc.

3. Ch. by diarrhea

4. Usually associated with vomiting & fever

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.

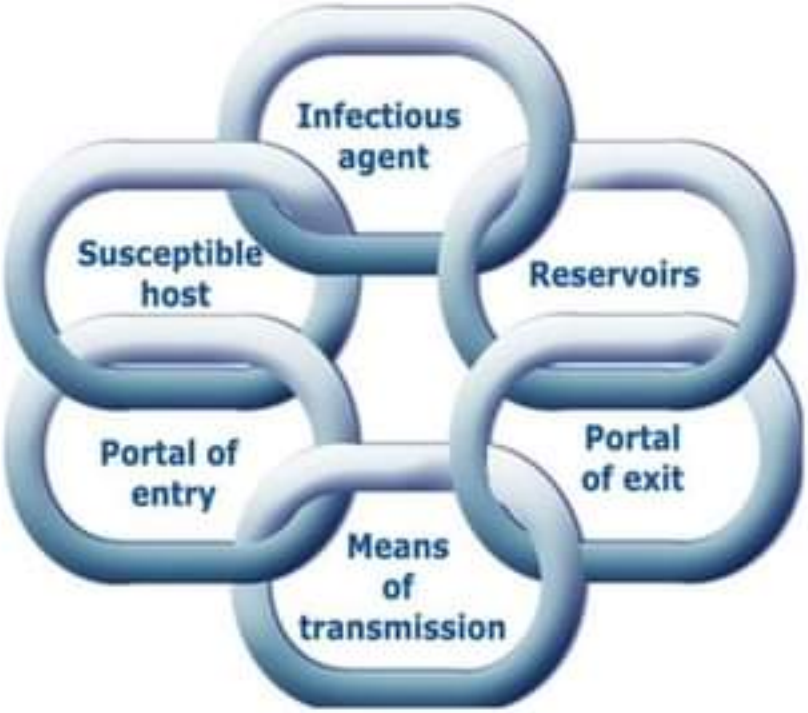
Epidemiology of childhood diarrhea

(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



[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	In developed countries
3.2 episodes/child/year	1.4 episodes/child/year
not changed much since 1990s	• 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 infs, 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 & malutrition.

[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
• Rotavirus (70%) • Enteroviruses • Adenoviruses • Hepatitis A & E	• E. Coli (ETEC, EHEC, EPEC, EIEC) • Shigella, almonella, • S. aureus, • Others	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 ± 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:

1- Invasive diarrhea	invades intestinal mucosa e.g. salmonella, EHEC, EIEC.
2- Secretory diarrhea	enterotoxins stimulate secretions of epithelial cells e.g. ETEC, vibrio cholera, staph aureus.
3- Osmotic diarrhea	↓ disaccharidase enzymes → hydrolysis of disaccharides into monosaccharides in lumen → osmotic diarrhea.
4- Others	↑ 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) ± blood & pus
- **Vomiting** usually appears later.

Clinical types of diarrhea:

Acute watery diarrhea:	• Acute onset of frequent loose or watery stools without visible bl. • Lasts for < 14 days
Chronic diarrhea:	Last for > 14 days with remission & exacerbation
Persistent diarrhea:	Acute diarrhea that lasts for 14 days or more without remission & exacerbation.
Dysentery:	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

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:

General rule	Give as much fluid as the child or adult wants until diarrhea stops.

As a guide, after each loose stool, give:

children aged < 2 years	50-100 ml of fluid
children aged 2-10 years	100-200 ml.
older children & adults	as much fluid as they want

(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**.

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

WHO formula, each packet contains:

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

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 1st 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 antityretics,
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.**

Key measures to prevent diarrhoea include: (WHO)

1. **promotion of breast-feeding**; exclusive breastfeeding for the 1st 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.