

## Diarrhoea

- Diarrhoeal disease is the second leading cause of death in children under five years old
- It is both preventable and treatable
- Each year diarrhoea kills around 760 000 children under five years of age

- A significant proportion of diarrhoeal disease can be prevented:
  - Through safe drinking-water
  - Adequate sanitation
  - And hygiene

- Globally, there are nearly 1.7 billion cases of diarrhoeal disease every year
- Diarrhoea is a leading cause of malnutrition in children under five years old
- In developing countries, children under three years old experience on average three episodes of diarrhoea every year

- Diarrhoea is defined as the passage of three or more loose stools per day (or more frequent passage than is normal for the individual)

## Types of diarrhoea

- There are three clinical types of diarrhoea:
  - Acute watery diarrhoea – lasts several hours or days, and includes cholera
  - Acute bloody diarrhoea – also called dysentery
  - Persistent diarrhoea – lasts 14 days or longer

## Causes

- **Infection of the gut** is the common cause of acute diarrhoea
- **Virus**
  - A virus is the common cause of infective diarrhoea
  - Rotavirus is common and adenovirus is second most common virus cause diarrhoea

- Water contaminated by bacteria or other germs is another common cause of infective diarrhoea, particularly in countries with poor sanitation
- Bacteria
  - E.coli, Campylobacter, salmonella
- Food poisoning (eating food infected with microbes) causes some cases of diarrhoea

OPTIVIEW

- Parasites

- **Non-infectious causes** of acute diarrhoea are uncommon in children For example, colitis (inflammation of the gut), food intolerance and various rare disorders of the gut



## Symptoms of acute infectious diarrhoea

- Symptoms can range from a mild stomach upset for a day or two with slight diarrhoea, to severe watery diarrhoea for several days or longer
- Blood or mucus can appear in the stools with some infections

- Crampy pains in the abdomen are common
- Pains may ease each time when some diarrhoea is passed
- Vomiting, high temperature (fever), aching limbs and headache may also develop

## Viral diarrhoea

- Viral infection is the leading cause of diarrhea in children and is most commonly in the winter months
- Symptoms of viral infection can include: watery diarrhea, vomiting, fever (temperature higher than 100.4°F or 38.0°C)
- Headache, abdominal cramps, lack of appetite, and muscle aches

- Viral infection begins 12 hours to 4 days after exposure, and resolves within three to seven days
- No specific treatment is available for viral of diarrhea
- Children with diarrhea from viral infections are best treated with supportive measures (oral rehydration solution, limited diet, and rest)
- Vomiting is the predominant feature

- Bacterial infection is sometimes hard to distinguish from viral infection
- Bacterial infections are more common in locations where there is unsafe drinking water and poor handling of sewage
- Persistent high fever (higher than  $40^{\circ}\text{C}$  or  $104^{\circ}\text{F}$ ) and diarrhea that is bloody or contains mucus are more common with bacterial diarrhea

- Most children with bacterial infection do not require antibiotics and will improve with time and supportive measures
- However treatment may be necessary in certain situations

- Parasitic infections are more common in locations where there is unsafe drinking water and poor handling of sewage
- Diarrhea from parasitic infections may last for weeks to months

- Antibiotic-associated diarrhea:
  - A number of antibiotics can cause diarrhea in both children and adults
  - The diarrhea is usually mild and typically does not cause dehydration or weight loss
  - The diarrhea usually resolves one to two days after antibiotics are finished



## DIARRHEA EVALUATION

- The evaluation of diarrhea in children requires:
  - Careful review of medical history
  - Physical examination, and diagnostic testing
  - The clinician will perform a thorough examination because there are some infections (such as an ear infection) that can cause diarrhea

## Monitoring for dehydration

- The most severe threat posed by diarrhoea is dehydration
- During a diarrhoeal episode, water and electrolytes (sodium, chloride, potassium and bicarbonate) are lost through liquid stools, vomit, sweat, urine and breathing
- Dehydration occurs when these losses are not replaced

## Dehydration

- 1. Early dehydration – no signs or symptoms:
- 2. Moderate dehydration:
  - Thirst
  - Restless or irritable behaviour
  - Decreased skin elasticity
  - Sunken eyes

■ Severe dehydration:

- Symptoms become more severe
- Shock, with diminished consciousness, lack of urine output, cool, moist extremities, a rapid and feeble pulse, low or undetectable blood pressure, and pale skin

Key measures to treat diarrhoea include the following:

- Rehydration: with oral rehydration solution (ORS)
- ORS is a mixture of clean water, salt and sugar
- ORS is absorbed in the small intestine and replaces the water and electrolytes lost in the faeces
- Zinc supplements:

- Nutrient-rich foods:
- The vicious circle of malnutrition and diarrhoea can be broken by continuing to give nutrient-rich foods – including breast milk – during an episode of diarrhea

- Oral rehydration therapy (ORT) was developed as a safer, less expensive, and easier alternative to intravenous fluids
- (ORS) contains glucose (a sugar) and electrolytes (sodium, potassium, chloride) that are lost in children with vomiting and diarrhea
- ORT does not cure diarrhea, but help to treat the dehydration

- Minimal or no dehydration
- Rehydration therapy is replacement of losses
- Less than 10 kg body weight - 60-120 mL ORS for each diarrhea stool or vomiting episode
- More than 10 kg body weight - 120-140 mL ORS for each diarrhea stool or vomiting episode



- Mild-to-moderate dehydration or some dehydration
  - Therapy - ORS (50-100 mL/kg over 3-4 h)
  - Replacement of losses
  - Less than 10 kg body weight - 60-120 mL ORS for each diarrhea stool or vomiting episode
  - More than 10 kg body weight - 120-140 mL ORS for each diarrhea stool or vomiting episode

- Severe dehydration: Rehydration therapy - Intravenous lactated Ringer solution or normal saline (20 mL/kg until perfusion and mental status improve)
  - Followed by 100 mL/kg Ringer lactate
  - If child less than 1 year 30 ml/Kg within 1 hour remaining 70ml/Kg over 5 hours
  - If child more than 1 year 30ml/Kg within half an hour remaining 70 ml/Kg over two and half an hour

## Medications

- Such as antibiotics and anti diarrheals are not necessary and could be harmful for infants or children with diarrhea
- Rarely, antibiotics used in cases of bacterial infection when a specific cause of the diarrhea has been found or is strongly suspected
- Antidiarrheal agents are not recommended for infants or children

- Specific suggestions for children who are tolerating a regular diet includes:
  - Most children with diarrhea tolerate full-strength cow's milk products
  - It is not necessary to dilute or avoid milk products, except in children with known allergies to cow's milk

## Prevention

- Key measures to prevent diarrhoea include:
  - Access to safe drinking-water
  - Use of improved sanitation
  - Hand washing with soap
  - Exclusive breastfeeding for the first six months of life

## Prevention

- Hygiene measures:
  - Hand washing is essential and very effective way to prevent the spread of infection
  - Hands should ideally be wet with water and plain or antimicrobial soap, and rubbed together for 15 to 30 seconds

## Complications

- Dehydration and electrolytes imbalance
- **Spread of infection** to other parts of your child's body, such as their bones, joints, or the meninges
- **Persistent diarrhoea syndromes** may rarely develop
- **Irritable bowel syndrome** is sometimes triggered by a bout of infectious diarrhoea

- Lactose intolerance
- **Haemolytic uraemic syndrome** is a rare complication
- It is usually associated with diarrhoea caused by a certain type of *E. coli* infection - *E. coli* O157
- **Malnutrition** may follow some gut infections



## CHRONIC DIARRHOEA

- Despite considerable advances in the understanding and management of diarrheal disorders in childhood, diarrhoea is still responsible for a major burden of childhood deaths globally
- An estimated 2.5 million deaths
- These findings indicate the continuing need to focus on prevention and management of childhood diarrhea in low-income countries

- Most diarrheal disorders resolve within the first week of the illness
- Only 1 to 3% of acute diarrhoeas become chronic, With a high mortality and morbidity
- Persistent diarrhea has been defined as an episode that begins acutely but lasts for 14 days or longer

## Classification of chronic Diarrhoea (CD)

- Type I—chronic diarrhoea in a previously normal child-90%
- Type II—chronic diarrhoea in a child with mostly inherent defect-10%

- Type 1 (persistent or protracted) starts as acute diarrhoea, but instead of subsiding in the usual time, diarrhoea goes on for a period of more than 2 weeks.

The various risk factors for this are:

Protein-energy malnutrition

- Younger age < 18 months
- Lack of breast-feeding
- Bottle-feeding
- Cow's milk., Soy protein
- Inappropriate use of antibiotics

- Improper therapy of ADD
- Use of antimotility drugs like loperamide
- Starvation during ADD
- Vitamin A deficiency
- Zinc deficiency
- Poor hygiene leading to re infection
- Certain extra intestinal infections, e.g., septicemia, UTI

## TYPE II CHRONIC DIARRHOEA

- Inflammatory causes
  - Tuberculosis.
  - Eosinophilic gastroenteritis
  - Crohn's disease
  - Necrotising enterocolitis
  - Allergic colitis
  - Henoch-Schonlein vasculitis

- Malabsorption states
  - Pancreatic diseases
  - Cystic fibrosis
  - Chronic pancreatitis
  - Congenital lipase deficiency
  - Congenital trypsin deficiency

- Lactase deficiency-congenital/acquired
- Glucose-galactose malabsorption



- Intestinal diseases
  - Tropical sprue
  - Coeliac disease
  - Whipple's disease
  - Intestinal lymphangiectasia

- **Metabolic disorders**

- Congenital chloride diarrhoea

- Abetalipoproteinaemia

- Acrodermatitis enteropathica

- Endocrine causes
  - Hyperthyroidism
  - Adrenal insufficiency
- Congenital alterations in electrolyte transport

- Immune defects
  - Agammaglobulinaemia
  - Isolated IgA deficiency
  - Combined immunodeficiency

- Anatomical or surgical disorder
  - Necrotizing enterocolitis
  - Short bowel syndrome
  - Hirschprung's disease
  - Intestinal lymphangiectasia

## Common Causes of Chronic Diarrhea

- INFANCY

- Postgastroenteritis malabsorption syndrome (persistent)
- Cow's milk/soy protein intolerance
- Secondary disaccharidase deficiencies
- Cystic fibrosis

- CHILDHOOD

- Chronic nonspecific diarrhea
- Secondary disaccharidase deficiencies
- Giardiasis



➤ Post gastroenteritis malabsorption syndrome

➤ Celiac disease

➤ Cystic fibrosis

• ADOLESCENCE

➤ Irritable bowel syndrome

➤ Inflammatory bowel disease

➤ Giardiasis

➤ Lactose intolerance

lactose intolerance

## Osmotic Vs Secretory Diarrhea

	OSMOTIC DIARRHEA	SECRETORY DIARRHEA
Volume of stool	<200 mL/24 hr	>200 mL/24 hr
Response to fasting	Diarrhea stops	Diarrhea continues
Stool Na <sup>+</sup>	<70 mEq/L	>70 mEq/L
Reducing substances <sup>(*)</sup>	Positive	Negative
Stool pH	<5	>6



## EVALUATION OF A CHILD WITH CHRONIC DIARRHOEA

- Stool history
  - Site of pathology, i.e. whether it is a SBD or LBD, and the nature of the disease process
  - SBD, -profuse watery, usually offensive stools, without blood

Stool characteristics: blood, mucous, nondigested substances, steatorrhoea

Physical examination: FTT, abdominal distension, visceromegaly, tenderness, presence of abdominal masses

Other organs affected, e.g. skin, respiratory system

Degree of dehydration and malnutrition should be

- Stool characteristics: blood, mucous, nondigested substances, steatorrhoea
- Physical examination: FTT, abdominal distension, visceromegaly, tenderness, presence of abdominal masses
- Other organs affected, e.g. skin, respiratory system
- Degree of dehydration and malnutrition should be

## Diagnosis

- A complete clinical history is mandatory. Some clinical signs and symptoms are relevant for a diagnostic approach
- Age of onset
- Nutritional assessment
- Associated symptoms: fever, vomiting, abdominal pain, anorexia

- Perianal fistula - Crohn's disease
- Clubbing - malabsorption syndromes, IBD
- Chronic liver disease- IBD
- Hepatomegaly -lymphomas, metastatic carcinoid, IBD and Whipple's disease
- Ascites - TB and lymphoma

## Investigation

- STOOOL EXAMINATION

- Microscopy
- Polymorphs and RBCs - bacterial colitis, whipworm colitis, amoebic colitis and in IBD
- Eosinophils are seen in milk or soya protein intolerance

- Stool pH and Reducing Substance
- A stool pH  $< 5.5$  (on cow's milk) or  $< 5$  (on breast milk) is suggestive of carbohydrate malabsorption and proximal small bowel damage.
- Demonstration of Reducing Sugars in Stool
- Stool Culture
- Stool culture is positive only in 20% of patients with acute diarrhoea and it is even lower in PD.

- Occult Blood
  - In acute diarrhoea- bacterial or parasitic colitis
  - chronic diarrhoea- IBD like ulcerative colitis and Crohn's colitis
- CBC
  - Haemoglobin
  - bacterial infections like septicaemia, urinary tract infection etc.
  - ESR - very high in septicaemia and lymphoma of the bowel.



- Peripheral Blood Picture
  - Iron deficiency anaemia or dimorphic anaemia
  - Abetalipoproteinaemia (acanthocytes)
- Biochemical Investigations
  - Serum electrolytes
  - Blood urea
  - Sugar and plasma proteins
- Blood and Urine Culture

- Barium meal follow through: This will detect ulcers and strictures of small bowel
- Small bowel biopsy: tropical sprue, coeliac disease, tuberculosis, lymphoma, abetalipoproteinaemia, Whipple's disease, amyloidosis, lymphangiectasia

## MANAGEMENT OF PERSISTENT DIARRHOEA

- About 30% of patients with PD require hospitalization, if they have 1 or more of the following:
  - Age: Less than 4 months and not breast feed.
  - Severe PEM.
  - Dehydration
  - Presence of systemic infections.
- Patients with PD and malnutrition are highly prone to systemic infections, including septicaemia

## Management

- The management of PD consists of 3 phases:
- Resuscitation phase (24-48 hours)
- Control of diarrhoea (up to 7 days)
- Rehabilitation phase (up to 8 weeks)

## RESUSCITATION PHASE

- Correction of
  - Dehydration, shock, electrolyte disturbance, hypoglycaemia and renal failure.
  - Appropriate antimicrobials

## Control of Diarrhoea

- The major factors responsible for PD
- Bacterial contamination of the gut
- Systemic infections
- Food allergen (cow milk, soy protein, egg protein etc.
- Lactose intolerance
- Toxins
- Bile acids

- In a recent study **cotrimoxazole** was found to be very useful in children with PD
- Shigellosis - ciprofloxacin
- Amebiasis - metronidazole

## REHABILITATION PHASE

- Aims
  - To improve the general health and nutritional status
  - To correct nutritional deficiencies
  - For catch-up growth
  - To educate the parents, especially to prevent future relapse.
  - These patients should be followed up regularly, as they are predisposed to develop PD again