

Aetiology of diarrhoea (1)

- Gastroenteritis of the gastro-intestinal tract caused by :
 - Bacteria
 - Enterotoxigenic *Escherichia coli*
 - *Shigella dysenteriae* (increase with age)
 - *Vibrio cholera*
 - *Cryptosporidium* species
 - *Campylobacter jejuni*
 - Viral
 - Rota virus (highest in infancy)
 - Norovirus Norwalk-like virus
 - Adenovirus
 - Parasites.
 - *Entamoeba histolytica*
(*Giardia Lamblia* appears to be protective in acute diarrhoea in community studies)

Aetiology of diarrhoea

- **Person-to-person contact**

- Rota virus
- Shigella,
- E.coli
- Campylobacter jejuni
- Amoeba

- **Food borne out-breaks**

- In high income countries – *salmonella*, *E coli*, *staph aureus*
- In low income countries – *salmonella*, *shigella*, *E coli*

- **Water-borne outbreaks**

- E.coli
- Cryptosporidium species
- Campylobacter jejuni
- Noroviruses
- *Shigella* species
- *Giardia*
- *Vibrio cholera*

Commonest cause diarrhoea/dehydration

- Watery diarrhoea
 - Rotavirus – commonest in infants
 - Cryptosporidium species (regardless of HIV status)
 - Shigella
 - Heat stable (ST)-Enterotoxigenic E.coli
 - Typical enteropathogenic E.coli
- Bloody diarrhoea – *shigella*
- Diarrhoea epidemics – *V. cholera*

Pathogenesis

- Non inflammatory diarrhoea – caused by :
 - enterotoxin production
 - Destruction of villus cells by viruses
 - Adherence by parasites
 - Adherence by bacteria
- Inflammatory diarrhoea
 - Bacteria directly invade the intestine
 - Bacteria produce cytotoxins causing fluid, protein and cells leak to the intestinal lumen

Non inflammatory diarrhoea

Hypersecretion of fluid and electrolytes

Inflammatory diarrhoea

Reduced absorption of sodium and chloride

TABLE 4 | Osmoregulation and volume regulation of extracellular fluid volume (16, 34).

	Osmoregulation	Volume regulation
What is sensed	Plasma osmolality	Effective circulating volume affected by volume depletion and/or dehydration
Sensors	Supraoptic and paraventricular nuclei of the hypothalamus	Cardiopulmonary baroreceptors located in the atria, ventricles and pulmonary interstitium Aortic and carotid baroreceptors Intrarenal receptors in the juxtaglomerular apparatus and renal interstitium
Effectors	Arginine vasopressin Thirst	Renin-angiotensin-aldosterone Atrial natriuretic peptide Arginine vasopressin
What is effected	Urine osmolality Urine volume Thirst (water intake)	Urinary sodium Thirst (water intake)

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Clinical feature

- Diarrhoea
 - (Ask watery, bloody, mucoid)
- Vomiting
- Nausea
- Abdominal cramps
- +/- fever

- Incubation period – variable
 - Rotavirus, E.coli Salmonella – 1-3days
 - V Cholera 24-48hours
 - Staph aureus – 1-6hours

- Location of infection – proximal small bowel = watery, no faecal leucocytes , colonic = dysentery + faecal PMN

Declining mortality, still a lot to be done

- No significant change in incidence of diarrhoea
- But the mortality has declined due to
 - Vaccination esp Rotavirus Vaccine
 - Better case management at home and hospital-based (ORS)
 - Improved nutritional management of child with diarrhoea
- Effective case management guidelines available but mortality still high in low and middle countries due to:
 - Delayed care seeking (home & community)
 - Delay in instituting correct care to prevent and treat dehydration (home, community and hospital based)
 - Suboptimal care (promotive, prevention and management of diarrhoea/dehydration)
- Odds of dying is 8.5 fold for severe/some dehydration
- >85% of deaths occur in first 2 years of life

Clinical evaluation

- History
- Obtain appropriate exposure history
- Assess degree of dehydration
 - Mental status – AVPU
 - Quality of pulses
 - Capillary refill time
 - Temperature of extremities and gradient
 - Ability to drink – eagerness to drink
 - Sunken eyes
 - Skin turgor

Unreliable signs/difficulty to assess

Mouth and tongue - dry

Eyes - dry

Tears

Urine output

Clinical evaluation

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Also
Assess
heart rate
and
breathing

Unreliable signs/difficulty to assess

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Tears

Urine output

Principles of acute diarrhoea management

- Increased fluids
- Continued feeding
- Zinc supplementation
- Rational use of antibiotics

Treatment of dehydration

Assess correctly & adequately
Classify the severity of dehydration

Stabilize
hemodynamic
status ie shock

Correct
dehydration

Give maintenance fluids,
Replace on going losses.

Age $\geq$ 1 month (excluding severe malnutrition)

Age $\geq$ 1 month (excluding severe malnutrition)

Yes

All four of

- Yes

iv Step 1 - 30 mls/kg Ringer's over 30 mins if age $\geq$ 12m OR over 60 mins if age $<$ 12m

NG rehydration - 120 mls/kg ORS over 6 hrs

Re-assess at least hourly and after 3-6hrs, re-classify as severe some or no dehydration and treat accordingly

Unable to drink or
AVPU < A plus:

- sunken eyes
- return of skin pinch ≥ 2 secs

Able to drink adequately
but 2 or more of:

- sunken eyes
- return of skin pinch 1 - 2 secs
- restlessness / irritability

- 1) ORS by mouth at 75 mls/kg over 4 hrs, **plus**,
- 2) Continue breast feeding as tolerated
Reassess at 4 hrs & treat according to classification

- 1) 10mls/kg ORS after each loose stool
- 2) Continue breast feeding and encourage feeding if > 6 months

All cases to receive Zinc. Antimicrobials are NOT indicated unless there is dysentery or proven amoebiasis or giardiasis.

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Zinc	10mg as Zn ⁺⁺ (tab)	for kids up to age < 6 months
	20mg as Zn ⁺⁺ (tab)	" " " "
		> 6 months

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Paediatric management guidelines

Treatment of severe dehydration

	Step 1*	30 mls / kg over 30 mins
	Step 2	70 mls / kg over 2.5 hours
	NGT rehydration-120ml/kg ORS over 8 hours can be used instead of steps 1 and 2 Re-assess at least hourly and after 3-8hrs, reclassify as severe, some or no dehydration and treat accordingly	

Give 5ml/kg of ORS once the child can drink

- Go to step 2 if child has received bolus for shock*

Prescribing ORS to prevent dehydration (Plan A)

- After correction of dehydration
- Give required feeds and fluids
- In addition, ORS 10ml/kg for every loose stool

In a child with diarrhea and NO dehydration give usual foods (appropriate for nutritional status) and fluids & breastfeeds more frequently

PLUS

10ml/kg after every loose stool

Vomiting and feeding?

- Vomiting is NOT a contra-indication to oral rehydration
- Careful counseling about, slow, steady administration of ORS is helpful.
- Breast feeding and other forms of feeding can and should continue
- There is no evidence of benefit from using half-strength feeds or gradual re-introduction of feeding.



Role of Zinc

- Modulating the host resistance to infectious agents
 - enhances the immune response, allowing for a better clearance of the pathogens
- Reduces the risk, severity, and duration of diarrheal diseases.
 - improves the absorption of water and electrolytes
 - increases the levels of brush border enzymes
 - may shorten the duration of diarrhoea by around 10 hours,
 - improves regeneration of the intestinal epithelium
- Zinc curtails the severity of the episode and prevent further occurrences in the ensuing 2 -3 months.
- Diarrhea can lead to zinc deficiency and the resulting zinc deficiency worsen duration and severity of diarrhoea.
- Zinc deficiency increase risk of diarrhoea mortality

Treat patient NOT the CASE

• Counsel the care taker:

Diarrhoea	What Causes diarrhoea How to Prevent diarrhoea
Dehydration	What causes dehydration How to prevent dehydration
Consequences	Malnutrition How to prevent malnutrition

Summary

- Promotive –
- Preventive –
- evidenced based case management