

Origin, causes and treatments of gastroenteritis using a case study

Lower gastrointestinal infections Case history

‘Bertrand, a 35 year old Frenchman with nausea, abdominal pain and diarrhoea’

Gastroenteritis is a non-specific term used to describe a condition that causes irritation and inflammation of the stomach and intestines in which there is a combination of nausea, vomiting, diarrhoea and abdominal pain.³ The gastrointestinal tract contains natural defences which include, gastric acid, bile salts, normal bowel flora, immune responses, motility and protection against toxins by the action of the liver. These influence the nature of local flora and of pathogens that may invade.⁵ It used to be known as winter vomiting disease.¹ Micro organisms responsible for gastrointestinal infections vary from one geographic area to another and it depends on the level of sanitation, economic development and hygiene standards. In developing countries it is a major cause of death in children and it is estimated that 4 million children under 5 die from this every year. Usually due to bacteria or parasite contaminating crops and water. In the UK it is estimated that 1 in 5 people will get gastroenteritis and it is usually due to food poisoning. Most cases clear up itself within a week. Severe infections are uncommon in the UK and epidemiology studies have generally noted that rotavirus induced infections peak in the winter and in the summer, bacteria infections are more common.

What can cause lower gastrointestinal infections?

Microbes can cause gastrointestinal infections and the common agents are:

Viral: rotavirus (common in children), noravirus (norwalk agent), calciviruses and astroviruses. These are usually self limiting and common in children.

Bacterial: This is a common cause of food poisoning.

Salmonella enterica: is usually associated with drinking un-pasteurised milk.

Shigella: This is the most common cause of dysentery.

Escherichia coli: most common species that cause diarrhoea are: entero-toxigenic and enteropathogenic species. These can either be heat stable or heat labile.

Staphylococcus aureus: This usually causes a mild disease and these species have salt intolerance so are found in salty foods. *Staph A* is spread mostly through food handling.

Clostridium spp: like *perfringens* and *difficile* mostly cause GI in a hospital setting due to the use of antibiotics.

Bacillus cereus: This is most commonly associated with the ‘chinese restaurant syndrome’ caused by fried rice.

Vibrio cholerae: This is spread through contaminated water.

Protozoa:

Entamoeba histolytica: common cause of amoebic dysentery

Giardia Lamblia: Cysts found in drinking water

Cryptosporidium parvum: through contaminated water.

Parasites: Not a common cause of GI infections but can be caused by some worms.¹⁰

How do microbes cause lower gastrointestinal infections?

Viruses: can replicate within the villous epithelium of the small bowel and this can cause epithelial cell destruction and villous shortening. This causes a loss of normal absorptive villous cells and their replacement with crypt-like cells that cause the intestine to secrete water and electrolytes.

Bacteria: mucosal adhesion- bacteria must first adhere to the mucosa in the small intestine to prevent them from being swept away if they want to multiply there.

Adhesion is caused by hair like antigens termed pili or fimbriae. **Toxins that cause secretion**-bacteria such as salmonella produce a toxin that alters epithelial cell function. These toxins can reduce the absorption of sodium by the villi and increase the secretion of chloride, this result in the loss of water and electrolytes. **Mucosal invasion**: Some bacteria can cause bloody diarrhoea by destroying mucosal epithelial cells. Invasion can occur as well and this results in microabscesses and ulcers.

Protozoa: can adhere to the small bowel epithelium and cause shortening of the villi. Also micro abscesses can occur if the strain is virulent.¹⁰

What is diarrhoea?

Diarrhoea is usually defined as the passage of three times or more loose or watery stools in a 24hr period. **Acute watery diarrhoea**- this comes on suddenly and lasts for less than 14 days. Vomiting and a fever may also occur but there is no visible blood in the faeces.

Dysentery- This is the presence of visible blood in the faeces. This can then cause anorexia and damage to mucosal cells. The most common cause of dysentery is shigella and campylobacter. **Persistent diarrhoea**- This is usually longer than 14 days and blood may be present. No single microbial cause is known. **Chronic diarrhoea**- this is recurrent long-lasting diarrhoea due to a non-infectious cause such as gluten insensitivity or metabolic disorders.¹¹

How is the infection spread?

Infectious agents that cause diarrhoea are spread by the oral-faecal route.

- Ingestion of faeces because of unwashed hands or dirty nails.
- Contaminated food or water which is then consumed.
- Preparing food with dirty hands
- Not disposing nappies appropriately
- Not storing food correctly. Don't leave at room temp for more than 1-2hrs. **raheela**

Risk factors

- Poor personal hygiene and lack of sanitation increase the incidence
- A compromised immune system leaves the patient vulnerable to gastroenteritis e.g. AIDS-elderly and very young
- Infection may arise from poorly cooked food, cooked food that has been left too long at room temperature or from uncooked food such as shellfish. Insufficient reheating of food not only fails to kill bacteria, but may speed up multiplication and increase the bacterial load ingested. Even if reheating of cooked food kills bacteria, enterotoxins such as staphylococcal exotoxin, are not destroyed
- Raw vegetables and untreated water.⁶

Symptoms

The incubation period for viruses is usually about a day, for bacillary dysentery a few hours to 4 days and for parasites 7 to 10 days. ³ incubation period varies according to ingested dose, shortest period seen is staphylococcus aureus food poisoning preformed toxin produces symptoms within 0.5 - 8hours of ingestion and longer periods associated with salmonellosis 12 - 72hours and shigellosis in which replication of microbe within the bowel may take a day or so before symptoms occur ⁶

Bloody diarrhoea should arouse suspicion of bacterial infection, especially E. coli O157 or after return from an exotic location it may be Entamoeba histolytica. Salmonella is also a possibility. ³

Symptoms of Gastro enteritis include:

- Diarrhoea

- Nausea and Vomiting - associated with small bowel infection, large bowel involvement associated with tenderness over the colon
 - Refusal of feeds (babies)
 - Loss of appetite (older children)
 - Fever, headache and rigors seen in shigellosis and salmonellosis where intestinal mucosa is involved
 - Tummy ache
 - Lethargy
 - Drowsiness
- If the child is dehydrated you may notice a dry mouth, sunken eyes with no tears and/or a sunken fontanelle (the gap in a baby's skull). Babies may also pass little or no urine. ²

Diagnosis

The diagnosis of gastroenteritis is usually made on the basis of clinical symptoms and signs. Physical Examination and culture of a stool sample may be necessary to determine the cause. ⁴

Investigations

Examinations performed;

- Check temperature, blood pressure, and heart and respiratory rates.
- Assess for abdominal tenderness.
- Assess for features of dehydration.

Investigate potential causes or contributing factors by asking about:

- Recent contact with someone with acute diarrhoea and/or vomiting.
 - Exposure to a known source of enteric infection (possibly contaminated water or food).
 - Recent travel abroad (may suggest E. coli or parasite infection from something eaten or drunk).
 - Recent antibiotics hospital admission within the last 8 weeks — suspect infection with *Clostridium difficile*
- Use of proton pump inhibitors (reduction in stomach acid reduces resistance to infective organisms).
- Exposure to poisons or irritants (swimming in contaminated water or drinking from suspicious fresh water eg mountain streams or wells -Giardia). ⁸
- Diet changes and food preparation habits and storage - undercooked, salads improperly stored and prepared food eg potato
- Perform stool microbial investigations if bloody and/or mucoid diarrhoea, and if immunocompromised. ⁷

Differential diagnosis: Not all diarrhoea or vomiting is gastroenteritis and other causes must be considered. Some other causes of diarrhoea or vomiting but not usually both are: Urinary tract infection, Constipation with overflow, Gastritis, perhaps from NSAID or alcohol abuse, Emesis gravidarum or, in late pregnancy, pre-eclampsia/eclampsia and Inflammatory bowel disease.

Treatment

The aims of management is to:

1 Identify extent of dehydration and treat accordingly.

Symptoms of moderate to severe dehydration

- low blood pressure, fast or weak pulse
- fainting

- severe muscle contractions in the arms, legs, stomach, and back
- convulsions
- a bloated stomach
- heart failure
- sunken dry eyes, with few or no tears
- lack of elasticity of the skin (when a bit of skin lifted up stays folded and takes a long time to go back to its normal position)
- rapid and deep breathing - faster than normal

Rehydration

- Mild dehydration - will usually only require oral rehydration with fluids or oral rehydration therapy. WHO recipe for developing nations⁸
- Moderate to severe dehydration may require admission to hospital for intravenous rehydration.

Get medical advice for small babies, children who seem very unwell or dehydrated (dehydration can be difficult to assess, so visit your GP if you're at all worried) or if the gastroenteritis doesn't settle in a day or two.

2 To educate patients in the management and prevention of gastroenteritis e.g. hand washing. Mariam

Arrange emergency admission to hospital if:

- The person is vomiting and unable to retain oral fluids.
- They have features of shock or severe dehydration.

Other factors influencing admission (clinical judgement should be used) include:

- Recent foreign travel.
- Older age (people 60 years of age or older are more at risk of complications).
- Fever.
- Bloody diarrhoea.
- Abdominal pain and tenderness.
- Diarrhoea lasting more than 10 days.
- Increased risk of poor outcome, for example:
 - Coexisting medical conditions — immunodeficiency, lack of stomach acid, inflammatory bowel disease, valvular heart disease, diabetes mellitus, renal impairment, rheumatoid disease, systemic lupus erythematosus.
 - Drugs — immunosuppressants or systemic steroids, proton pump inhibitors, H₂ - receptor antagonists, simple antacids, angiotensin-converting enzyme inhibitors, diuretics.

Drugs

OTC preparation in U.K contain less NaCl and more glucose-useful in moderate attacks of diarrhoea.

- Antibiotics are not recommended (as most attacks are self limiting) for adults with acute diarrhoea of unknown pathology, it is only appropriate when gastroenteritis is due to a known microbiological cause. If gastroenteritis is severe and community-acquired, there may be benefit from empirical treatment with ciprofloxacin to shorten duration without increasing carrier status. Giardiasis is treated with metronidazole.
- Antidiarrhoeal drugs are not usually necessary for the management of gastroenteritis. OTC antidiarrhoeal cause side effects such as tummy cramps dizziness and skin reactions

- Antimotility drugs may be useful for symptomatic control in adults with mild-to-moderate diarrhoea, for example if quicker resolution of diarrhoea would enable the person to continue essential activities. **loperamide** is the antimotility drug of choice. Avoid antimotility drugs if there is blood and/or mucus in the stools, or high fever (indicating dysentery).
- Anti-emetics are not usually necessary for the primary care management. Anti-emetics (such as metoclopramide 10 mg intramuscularly, phenegan, prochlorperazine or ondansetron prescribed as suppositories sometimes) can be helpful in adults with severe vomiting.⁴

Prevention

Most forms of gastroenteritis are highly infectious. It is therefore essential to practice good hygiene, such as washing your hands after going to toilet and before preparing food. If you or your children have gastroenteritis, do not return to work, or let your children go to school or nursery, until 48 hours has passed since the last episode of diarrhoea or vomiting.¹ Vaccination for salmonella typhi, V. cholerae and rotavirus. Prevalent food high in sugar because osmotic load might worsen diarrhoea. Stop sharing or preparing food for others if infected. Disinfect toilets, soiled laundry and floors.⁸

Complications

- Infants, the elderly and those with immunological compromise are more likely to have more severe disease and to require admission to hospital for rehydration. In severe cases hypovolaemic shock and even death can occur.
- Salmonella can invade bones, joints, meninges, or the gallbladder.
- Toxic megacolon is rare.
- Irritable Bowel Syndrome may follow gastroenteritis.
- Poor absorption of drugs such as anticonvulsants or oral contraceptives may occur.
- Reactive features may include arthritis, carditis, urticaria, erythema nodosum, conjunctivitis, and Reiter's syndrome
 - Untreated severe dehydration may result in seizures, permanent brain damage, or death.

Summary of case study 2

35 year old frenchman
lives in england for the past 5 years
visited Bordeaux a month ago
attended a friday lunchtime party
uncertain of what he has eaten in the last 3 days

Symptoms

nausea
abdominal pain (central in location and "crampy" in character)
diarrhoea (happened early in the morning and getting worse)

Differentiate between food poisoning and travellers diarrhoea. Since he visited Bordeaux a month ago it is highly unlikely that he will show the symptoms now since most micro organisms incubation period is between hrs to days. Next find out about the diarrhoea is it an infectious cause or a non-infectious cause. Find out if he's sensitive to gluten or if he has crohns disease or irritable bowel syndrome. Are they on any medication eg. antibiotics as this

is a common side effect. Find out the urgency of the case so is there dysentery, can they keep liquid down, is the pain unbearable. Refer to the hospital immediately. Looking at all of his symptoms and the fact that he went out for lunch on Friday we can assume that the cause is infectious and he probably has acute watery diarrhoea caused by acute gastroenteritis.

What will the pharmacist advice?

hands should be washed thoroughly before handling food and after using the toilet
towels and flannels should not be shared

he should drink (should be supplemented with fruit juices and soups) lots of fluids
avoid dairy products, fatty and spicy food; small light foods should be eaten instead
Avoid work until he is at least 48 hours free from diarrhoea and vomiting
if symptoms persist after 72 hours consult your GP.

Treatment

Ask if they are allergic to anything and what medication they are on before giving anything.
painkiller such as paracetamol for the crampy pains

In Bertrand's case we are not dispensing any drug as his diarrhoea hasn't been present for at least 24 hours

Anti-motility drugs for the diarrhoea such as Loperamide (Imodium) or bismuth subsalicylate

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