

Case Study: Cholera in a 32-Year-Old Male Patient

Personal history:

Mr Radwan is 32 years old fisherman. He lives in a small village near Wady-Halfa, Sudan. Married and has 2 children, with no special habits.

Chief Complaint: Profuse watery diarrhea for 2 days.

History of Present Illness (HPI)

The patient reports experiencing sudden onset of frequent, watery, and painless diarrhea for the past 48 hours. The diarrhea is described as "rice-water" in appearance, with no blood or mucus. He also reports vomiting several times in the last 24 hours. The patient denies any prior history of similar episodes.

Associated Symptoms include: Severe thirst, Muscle cramps, Weakness, Dizziness, particularly on standing, No fever, abdominal pain, or recent travel.

Environmental Exposure: The patient was on a fishing trip on a small Nile island for a week, where clean water is scarce. He admits to drinking water from an untreated source (a local well) in the last 3 days.

Past Medical History (PMH)

No known chronic diseases, No previous similar episodes, No medications, Immunization history is complete for compulsory vaccines only (no vaccination for cholera).

Physical Examination

General Appearance: The patient appears fatigued, restless, and in moderate distress.

Vital Signs:

- Temperature: 36.8°C (98.2°F)
- Heart Rate: 120 bpm (tachycardia)
- Blood Pressure: 90/60 mmHg (hypotensive)
- Respiratory Rate: 22 breaths/min
- Oxygen Saturation: 97% on room air

Head and Neck: Dry mucous membranes, Sunken eyes

Cardiovascular: Tachycardia with weak peripheral pulses and delayed capillary refill (>3 seconds)

Abdominal Exam: Soft, non-tender, No organomegaly, No signs of peritonitis

Extremities: Poor skin turgor, Muscle cramps noted in the legs

Laboratory and Diagnostic Tests

Stool Sample: Stool microscopy reveals no pus cells or red blood cells.

Blood Work:

- Sodium (Na⁺): 128 mEq/L (Hyponatremia)
- Potassium (K⁺): 3.2 mEq/L (Hypokalemia)
- Bicarbonate (HCO₃⁻): 15 mEq/L (Metabolic acidosis)
- Blood Urea Nitrogen (BUN): 24 mg/dL (Elevated)
- Creatinine: 1.3 mg/dL (Normal, early stage of dehydration)

At this level what is our DD?

1. Acute Gastroenteritis (Viral, Bacterial, or Parasitic)
2. Food Poisoning (Toxin-Mediated)
3. Other Diarrheal Diseases
4. Non-Infectious Causes of diarrhea
5. Dysentery Syndromes
6. Non-Infectious Causes of Dehydration

1. Acute Gastroenteritis (Viral, Bacterial, or Parasitic)

Viral Gastroenteritis:

- Rotavirus: Common in children but can affect adults. Presents with watery diarrhea, vomiting, and fever. Less severe dehydration compared to cholera.
- Norovirus: Often associated with outbreaks (cruise ships, healthcare facilities). Causes acute vomiting and diarrhea, with short duration.

Bacterial Gastroenteritis:

- Enterotoxigenic Escherichia coli (ETEC): Major cause of "traveler's diarrhea." Presents with watery diarrhea, abdominal cramps, nausea, but usually less severe than cholera.

- *Shigella* spp.: Causes dysentery with bloody diarrhea, fever, and abdominal pain. Differentiated by the presence of blood and pus in stool, which are absent in cholera.
- *Salmonella* spp.: Can present with watery diarrhea, fever, and abdominal cramps. Associated with foodborne transmission.
- *Campylobacter jejuni*: Typically presents with fever, abdominal pain, and sometimes bloody diarrhea.

Parasitic Gastroenteritis:

- Giardiasis: Caused by *Giardia lamblia*, characterized by prolonged diarrhea, malabsorption, and bloating, often with foul-smelling stools. More subacute in onset compared to cholera.

2. Food Poisoning (Toxin-Mediated)

- Staphylococcus aureus toxin: Causes rapid onset vomiting and diarrhea, typically within hours of ingesting contaminated food. Symptoms are short-lived, usually resolving within 24-48 hours.
- Bacillus cereus toxin: Causes either vomiting (emetic form) or watery diarrhea (diarrheal form) after ingestion of contaminated rice or food.
- Clostridium perfringens toxin: Presents with watery diarrhea and abdominal cramps after ingestion of improperly stored or reheated meat or poultry. No vomiting or fever.

3. Other Diarrheal Diseases

- Cryptosporidiosis: A parasitic infection that causes watery diarrhea, especially in immunocompromised individuals. The diarrhea is more chronic and can persist for weeks.
- Amebiasis (caused by *Entamoeba histolytica*): Typically causes dysentery (bloody diarrhea), but some forms can present with watery diarrhea.

4. Non-Infectious Causes

- Irritable Bowel Syndrome (IBS): Can present with alternating diarrhea and constipation. The diarrhea in IBS is typically less severe, with no dehydration or signs of systemic infection.
- Lactose Intolerance: Presents with watery diarrhea, bloating, and flatulence after ingestion of lactose-containing foods. This is a chronic condition that worsens with specific dietary triggers.
- Celiac Disease: Chronic condition triggered by gluten ingestion, leading to watery diarrhea, malabsorption, and weight loss. It tends to have a more gradual onset compared to the acute presentation of cholera.

5. Dysentery Syndromes

Though dysentery presents differently from cholera (bloody stools vs. watery diarrhea), some dysentery-causing organisms may initially cause watery diarrhea:

- Shigellosis (*Shigella*): Starts with watery diarrhea, but quickly progresses to dysentery with blood, pus, and tenesmus.
- Amebic Dysentery: Initially presents with watery diarrhea before blood and mucus appear.

6. Non-Infectious Causes of Dehydration

- Heat Exhaustion/Dehydration: Due to prolonged heat exposure, dehydration can cause symptoms of dry mucous membranes, tachycardia, and hypotension. However, this will lack the profuse diarrhea characteristic of cholera.

Key Differentiating Features of Cholera:

- Profuse "rice-water" diarrhea (no blood, no pus)
- Painless diarrhea
- Rapid onset and significant dehydration with electrolyte imbalances
- Absence of fever (in most cases)
- History of exposure to contaminated water or poor sanitation areas
- Out break of cases or presence in endemic area

What to do next?

As there is an out break of watery massive diarrhea in this village cholera out break is suspected.

Rapid diagnostic test for cholera was done for this case with positive results. stool culture was done on TCBS. Culture shows the presence of *Vibrio cholerae* serogroup O1

Diagnosis

- **Cholera** due to *Vibrio cholerae* O1 serogroup, With moderate dehydration risky for severe complications if not treated promptly.

What are these complications?

- **Complications:**
 - Severe dehydration
 - Electrolyte imbalances (hyponatremia, hypokalemia)
 - Metabolic acidosis
 - Hypovolemic shock, acute renal failure and death

Cholera is an acute diarrhoeal infection caused by ingestion of food or water contaminated with the bacterium *Vibrio cholerae*. Every year there are an estimated 3 to 5 million cholera cases and 100 000 to 120 000 deaths due to cholera. The short incubation period of two hours to five days, enhances the potentially explosive pattern of outbreaks.

Cholera is an extremely virulent disease. It affects both children and adults and can kill within hours. About 75% of people infected with *Vibrio cholerae* do not develop any symptoms, although the bacteria are present in their faeces for 7–14 days after infection and are shed back into the environment, potentially infecting other people.

Globally, cholera incidence has increased steadily since the beginning of the millenium with cholera outbreaks persisting in Sub-Saharan Africa. There are a number of countries in the Eastern Mediterranean Region that are in a state of complex emergency. Lack of safe water supply and poor environmental sanitation in war ravaged countries are formidable challenges.

Pathophysiology

Cholera is caused by ingestion of food or water contaminated with *Vibrio cholerae*. The bacteria colonize the small intestine and secrete cholera toxin, leading to the secretion of chloride and water into the intestinal lumen. This results in profuse watery diarrhea, commonly described as “rice-water stool,” and leads to rapid dehydration, electrolyte imbalances, and metabolic acidosis.

How to manage this patient?

Management Plan

1-Immediate Rehydration:

- **Oral Rehydration Therapy (ORT):**
 - Administer oral rehydration solution (ORS) containing water, salt, and sugar to replenish lost fluids and electrolytes.
 - Encourage the patient to drink as much ORS as tolerated.
- **Intravenous Fluids:**
 - Initiate IV fluid therapy (Ringer's lactate or normal saline) due to moderate dehydration and hypotension. Adjust fluid rates according to clinical response and vital signs.

2-Antibiotic Therapy:

- **Antibiotics to shorten the course of diarrhea:**

- Doxycycline (single dose of 300 mg orally for adults)
- Alternatively, azithromycin if resistant to doxycycline.

3-Monitor Electrolytes:

- Monitor electrolytes, especially sodium and potassium, and correct imbalances with IV or oral supplements.

4-Follow-Up:

- Monitor urine output, heart rate, blood pressure, and mental status for signs of improvement.
- Educate the patient and the community on preventive measures such as improving sanitation and ensuring access to safe drinking water.

Is it an outbreak? What to do next?

Steps to Diagnose a Cholera Outbreak

once suspect it report it

1. Clinical Diagnosis of Suspected Cases

Cholera is suspected in patients who present with:

- Acute onset of profuse watery diarrhea, often described as "rice-water stools."
- Rapid dehydration, with signs like dry mucous membranes, sunken eyes, poor skin turgor, and tachycardia.
- Absence of fever (usually, cholera patients are afebrile).
- Recent exposure to areas with poor sanitation, contaminated water, or previous cholera cases.

In an endemic area or during an outbreak you can diagnose based on clinical.

- Adults: Any patient with acute watery diarrhea, especially with rapid dehydration.
- Children under 5 years: Severe dehydration or death from acute watery diarrhea.

2. Laboratory Confirmation of Vibrio cholerae first case

- The gold standard for diagnosing cholera is stool culture to isolate Vibrio cholerae, particularly serogroups O1 and O139, which are responsible for most cholera outbreaks.
- Special media like thiosulfate-citrate-bile salts-sucrose (TCBS) agar are used to grow Vibrio cholerae.

Rapid Diagnostic Tests (RDTs):

- RDTs can detect *Vibrio cholerae* antigens directly in stool samples and provide quick, preliminary confirmation within 15-30 minutes.
- While less sensitive than culture, RDTs are valuable during outbreaks for rapid field diagnosis. Positive RDTs should be confirmed with stool cultures.

Polymerase Chain Reaction (PCR):

- PCR testing can confirm the presence of *Vibrio cholerae* more sensitively and rapidly than culture. It is often used in reference laboratories.

Serotyping and Toxin Detection:

- Once *Vibrio cholerae* is isolated, serotyping can determine if it belongs to the O1 or O139 serogroups.
- Cholera toxin (CTX) production can also be identified via laboratory tests.

3. Epidemiological Assessment

Once cholera is clinically and microbiologically confirmed, an outbreak is declared when:

- Clusters of cases occur in a defined geographic area, suggesting person-to-person transmission or common exposure to contaminated food or water sources in non endemic area or rate sharply increased in endemic areas

Example of Cholera Outbreak Diagnosis:

- Suspected outbreak:
 - A rural village reports a sudden increase in patients presenting with severe watery diarrhea and rapid dehydration over a 3-day period.
- Initial response:
 - A medical team arrives and collects stool samples from affected individuals.
- Laboratory confirmation:
 - Stool culture isolates *Vibrio cholerae* O1. An RDT is positive in a field setting.
- Public health response:
 - Mapping identifies clusters near a contaminated water source, confirming local transmission. The health department declares

an outbreak and initiates control measures, including water treatment and community education.

Summary

“Teaching Points for Physicians”

Key Aspects of Diagnosis:

- Recognizing the classic "rice-water" diarrhea and rapid dehydration.
- No fever
- Stool is not inflammatory
- Needs high degree of suspicion to diagnose in non endemic areas
- Distinguishing cholera from other causes of acute diarrhea by history and risk factors (contaminated water, living conditions).

Key Points for Diagnosing a Cholera Outbreak:

- Rapid identification of cholera cases through clinical symptoms.
- Laboratory confirmation with stool culture, rapid diagnostic tests, or PCR.
- Public health measures to identify the scope and transmission route of the outbreak.
- Continuous surveillance to monitor and contain the spread of the disease.

Early diagnosis and intervention are critical to control the outbreak, prevent deaths, and limit further transmission.

Prompt Treatment:

- Early and aggressive rehydration is the cornerstone of cholera management.
- Proper use of ORT can prevent fatalities in over 90% of cases.
- Antibiotics are important but secondary to rehydration therapy.

Preventive Measures:

- Cholera is preventable with access to clean water and sanitation.
- Community education on hygiene and vaccination in endemic areas can help reduce incidence.



Rice water cholera stool



Rice-water stools of cholera



