



Clinical Updates on Cholera

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After more than 30 years of eradication, culture-confirmed cholera cases and deaths threaten the resurgence of the cholera epidemic in Lebanon. The cholera outbreak first appeared in the Syrian refugee camps of Akkar, North Lebanon, as the neighboring country Syria is still struggling to contain this waterborne disease. Given the collapse of the public health system, the lack of effective sewerage networks, and the lack of access to safe water and sanitation, concerns are growing about a widespread outbreak in Lebanon^{1,2}.

A prompt awareness program on cholera transmission and an effective prevention and management strategy are essential to limit the rapid spread of cholera in Lebanon.

PATHOPHYSIOLOGY

Cholera is a potentially epidemic, life-threatening, waterborne disease caused by infection of the intestine with the toxigenic bacterium *Vibrio cholerae* serogroup O1 or O139³. It is characterized by secretory diarrhea with numerous, voluminous watery stools, often accompanied by vomiting, resulting in hypovolemic shock and acidosis⁴.

TRANSMISSION

Cholera can be contracted by drinking water or eating food contaminated with cholera. In an epidemic, feces of an infected person are usually the source of contamination and remain for 1-10 days after infection, even in asymptomatic individuals. Feces are shed back into the environment and contaminate water or food and, potentially infecting other people^{3,5}.

Thus, the disease can spread quickly in areas with inadequate sewage and drinking water treatment, poor sanitation, and poor hygiene. Because the infection is unlikely to spread from person to person, casual contact with an infected person is not a risk factor for becoming ill³.



SIGNS AND SYMPTOMS

Symptoms appear 2-3 days after ingesting contaminated food/water and include⁶:

- **Diarrhea.** Cholera-related diarrhea appears suddenly and can result in dangerous fluid loss of up to about 1 liter per hour. Cholera diarrhea has a pale, milky appearance that resembles water in which rice has been rinsed.
- **Nausea and vomiting.** Vomiting is expected in the early stages of cholera and can last several hours.
- **Dehydration.** Dehydration can occur within hours of the onset of cholera symptoms and can range from mild to severe. A 10% or higher loss of body weight indicates severe dehydration.

The table below describes the characteristic signs and symptoms of the different types of dehydration⁷:

Table 1. Cholera - Signs and Symptoms of Dehydration ⁷		
Severe Dehydration	Some Dehydration	No Dehydration
One or more danger signs: <ul style="list-style-type: none"> • Lethargic or unconscious • Absent or weak pulse • Respiratory distress OR at least two of the following: <ul style="list-style-type: none"> • Sunken eyes • Not able to drink or drinks poorly • Skin pinch goes back very slowly 	No danger signs AND at least two of the following: <ul style="list-style-type: none"> • Irritable or restless • Sunken eyes • Rapid pulse • Thirsty (drinks eagerly) • Skin pinch goes back slowly 	Signs: <ul style="list-style-type: none"> • Awake and alert • Normal pulse • Normal thirst • Eyes not sunken • Skin pinch normal
<small>Centers for Disease Control and Prevention. Cholera - <i>Vibrio cholerae</i> infection. Rehydration therapy. 2020. https://www.cdc.gov/cholera/treatment/rehydration-therapy.html</small>		

One in every ten people infected with cholera will develop severe symptoms such as watery diarrhea, vomiting, and leg cramps³. People living in an endemic region should seek treatment immediately in case of severe diarrhea. Rapid loss of body fluids causes dehydration, which, in turn, can lead to electrolyte imbalance due to the rapid loss of minerals in the blood that maintains the balance of fluids in the body⁴. Severe dehydration is a medical emergency that requires immediate care⁴.

Electrolyte imbalance can cause severe symptoms, such as^{3,6}:

- **Muscle cramps:** caused by the rapid loss of salts such as sodium, chloride, and potassium.
- **Shock:** one of the most severe complications of dehydration; it occurs when a decrease in blood volume causes a drop in blood pressure and a depleted amount of oxygen in the body. Death can occur within hours if electrolyte imbalance is not treated and within minutes if a severe hypovolemic shock occurs and remains untreated.



CHOLERA INFECTION TREATMENT

1. Rehydration therapy⁷

Rehydration therapy refers to the prompt restoration of lost fluids and salts and is the primary treatment for cholera patients.

- Rehydration (intravenous and oral) is associated with significantly lower mortality and continues to be the mainstay of cholera treatment.
- In cases of severe dehydration, IV fluids should be administered immediately. If the patient is able to drink, oral rehydration solutions (ORS) should be administered orally while the IV drip is being set up. Ringer's lactate is the best IV fluid to use. If unavailable, it can be substituted with normal saline solution.
- It is critical to monitor the fluids administered intravenously and keep track of the fluids lost through diarrhea and vomiting.
- The patient should be reassessed every 15-30 minutes while rehydration is maintained:
 - The fluid administration rate can be increased or prolonged as needed to achieve adequate rehydration. The patient may require $\geq 200\text{ml/kg}$ of IV fluids during the first 24 hours of treatment.
 - The fluid administration can be decreased if rehydration is achieved earlier than anticipated.
 - The ORS prescribed quantity can be increased if requested by the patient.
- ORS can be administered through nasogastric tubes if the patient is alert but unable to drink sufficient quantities independently.
- Once hydration has improved and the patient is able to drink, switching from intravenous to oral rehydration solution is necessary to conserve IV fluids while lowering the risk of phlebitis and other complications. The signs of adequate rehydration are:
 - Skin goes back normally when pinched.
 - Thirst has subsided.
 - Urine has been passed.
 - Pulse is strong.

The table below details the rehydration treatment recommendations and administration methods according to the type of dehydration and the patient's age range⁷:

Table 2. Cholera - Fluid Replacement or Treatment Recommendations ⁷			
Dehydration Type	Treatment Recommendation	Administration Method	
Severe dehydration	Intravenous Ringer's lactate or, if not available, normal saline and ORS as outlined in the guidance above.	Age <1 year	
		Timeframe	
		0–60 min	Total volume 30 ml/kg*
		60 min–6 h	70 ml/kg
		6 h–24 h	100 ml/kg
		Age ≥ 1 year	
		Timeframe	
0–30 min	30 ml/kg*		
30 min–3 h	70 ml/kg		
*Repeat once if radial pulse is still very weak or not detectable			



Some dehydration	Oral rehydration solution	<p>Administer in the first 4 hours (for all ages)</p> <p>75 ml/kg in first 4 hours. Then reassess, and if patient still shows signs of dehydration, repeat. If not, use ORS to replace ongoing diarrheal losses using the treatment plan for no dehydration below. Patients do not need IV fluids, but need close monitoring during the first 4 hours.</p>								
No dehydration	Oral rehydration solution	<p>Administer after each loose stool:</p> <table> <thead> <tr> <th>Age</th> <th>Volume of ORS</th> </tr> </thead> <tbody> <tr> <td><2 years</td> <td>50–100 ml</td> </tr> <tr> <td>2–9 years</td> <td>100–200 ml</td> </tr> <tr> <td>≥10 years</td> <td>As much as patient wants</td> </tr> </tbody> </table>	Age	Volume of ORS	<2 years	50–100 ml	2–9 years	100–200 ml	≥10 years	As much as patient wants
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Centers for Disease Control and Prevention. Cholera - Vibrio cholerae infection. Rehydration therapy. 2020.
<https://www.cdc.gov/cholera/treatment/rehydration-therapy.html>

2. Antibiotic treatment⁸

Treatment with antibiotics reduces fluid requirements and the duration of illness. Antibiotics are only indicated for severe cases of cholera. They have the potential to cause nausea and vomiting; hence, side effects of the gastrointestinal tract should be closely monitored, especially in dehydrated patients. However:

- None of the guidelines recommend antibiotics as prophylaxis for cholera prevention, and all emphasize that antibiotics should be used in conjunction with aggressive hydration.
- Antibiotics should not be given to cholera patients who have only mild or no diarrhea and/or dehydration.
- Surveillance of antibiotic resistance among bacterial isolates from any outbreak is critical for understanding and limiting the spread of resistance.

Table 3. Recommendations for Cholera Treatment with Antibiotics

Age group	First-line drug choice	Alternate drug choices
Children <12 years old	Doxycycline 2–4 mg/kg by mouth (per os, p.o.) single dose	Azithromycin 20 mg/kg (max 1 g) p.o. single dose, or ciprofloxacin 20 mg/kg (max 1 g) p.o. single dose
Children ≥12 years old and adults, including pregnant women	Doxycycline 300 mg p.o. single dose	Azithromycin 1 g p.o. single dose, or ciprofloxacin 1 g p.o. single dose

Centers for Disease Control and Prevention. Cholera - Vibrio cholerae infection. Antibiotic Treatment. 2022.
<https://www.cdc.gov/cholera/treatment/rehydration-therapy.html>



3. Zinc

Treatment with zinc has been shown to improve cholera symptoms in children. When available, supplementation with 20 mg zinc per day should be started immediately in children 6 months or older⁹.

Special Considerations:

- Administering zinc with some antibiotics, such as ciprofloxacin, may reduce the absorption of these antibiotics. In these circumstances antibiotics should be administered 2 hours before or 4-6 hours after taking zinc⁹.
- Treatment with proton pump inhibitors causes severe hypochlorhydria and leads to bacterial colonization and increased susceptibility to enteric bacterial infection, including an increased vulnerability to cholera infection¹⁰.

CHOLERA PREVENTION^{11,12,13}

Preparing safe water

- If the water is cloudy, **filter** (using a clean cloth, paper towel, or coffee filter) before disinfecting, or allow it to settle.
- Bring the clear water to a rolling **boil** for at least 3 minutes. Let it cool and store it in clean, sanitized containers with tight covers.
- If boiling is not possible, disinfect with **chlorine**. Use commercially available chlorine food disinfection solutions or tablets and follow the manufacturer's instructions. **Wait for at least 30 minutes before use.**
- If a chlorine product is unavailable, use **household bleach** as per the table below (this technique also applies to sanitizing water tanks). **Wait for at least 30 minutes before use.**

Table 4. Preparing Safe Water According to Bleach Concentration	
<5% (50,000 ppm)	5%-10% (50,000 ppm-100,000 ppm)
Add 0.2 ml (4 drops) to 1 liter of water (200 ml/m ³)	Add 0.1 ml (2 drops) to 1 liter of water (100 ml/m ³)
If the water is cloudy, murky, colored, or very cold, add double the amount of bleach	

Food and drinks

- Use safe (bottled, boiled, or treated) water to drink, brush teeth, wash and prepare food, and make ice cubes.
- Wash and scrub hands for at least 20 seconds before preparing food or after going to the toilet.
- Clean food preparation areas and kitchenware with soap and safe water and let them dry completely before reuse.
- Cook food well for at least 15 minutes (especially **seafood**); keep it covered, and eat it hot.
- Avoid eating raw foods.
- Peel fruits and vegetables.
- Do not share food, drinks, utensils, and cutlery.
- Do not use drinking fountains.



Hygiene and use of toilets for people living in community and camps

- Do not defecate in any body of water (well, lake, etc.).
- Use latrines/toilets or bury your excrement.
- Clean latrines/toilets and surfaces contaminated with feces using a solution of household bleach diluted as follows: 1 part of household bleach to 9 parts of water.
- If latrines/toilets/chemical toilets are not available.
 - Defecate at least 30 meters from any body of water and then bury excrement.
 - Dig new latrines or temporary pit toilets at least a half-meter deep and at least 30 meters away from any body of water.
- Wash patients' clothes with a 2% chlorine solution. If chlorine is not available, patients' bedding and clothing should be stirred for 5 minutes in boiling water and dried in direct sunlight, or washed with soap and dried thoroughly in direct sunlight.

Note¹⁴:

- Food, daycare, and healthcare workers should be tested regularly.
- If positive, they should be excluded from employment until all the following have been confirmed:
 - The case has been asymptomatic for at least 24 hours.
 - One negative stool culture has been confirmed.
 - The case has been counseled about preventive measures, such as hand washing procedures, that must be followed to prevent transmission of disease.



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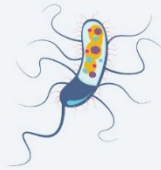
CHOLERA VISUALS



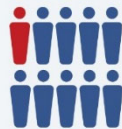
What is **CHOLERA**?



A secretory diarrhea
potentially epidemic and life-threatening



Caused by
Vibrio cholerae serogroup O1 or O139



1 in 10 people
will develop severe symptoms
(watery diarrhea, vomiting, and leg cramps)



CHOLERA Signs and Symptoms

Dehydration

(mild to severe)
Can lead to electrolyte imbalance and death if untreated



Diarrhea



sudden milky-appearance diarrhea with dangerous fluid loss (about 1L/hour)



Nausea & Vomiting

in early stages of the disease



1 | MODE OF TRANSMISSION

Usually the **feces** of an infected person



Drinking contaminated water

Eating contaminated food



2 | SOURCE OF THE CONTAMINATION

3 | DISEASE SPREAD



Rehydration therapy is the primary treatment

Antibiotic treatment reduces fluids requirements and duration of illness and is indicated for severe cases

Zinc treatment has been shown to improve symptoms in children

Areas with:

- inadequate treatment of sewage and drinking water
- poor sanitation
- inadequate hygiene

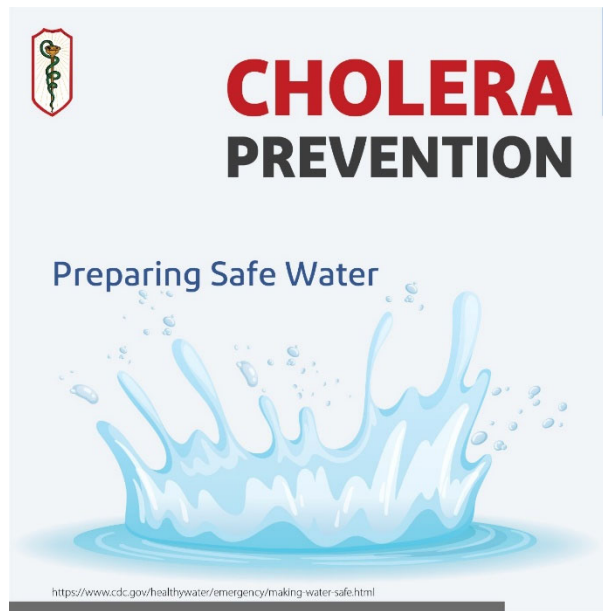


Infection is **NOT** likely to spread directly from **person to person**



PPIs Severe hypochlorhydria generated by PPI use leads to bacterial colonisation and increased susceptibility to enteric bacterial infection

4 | TREATMENT TIPS



1 | FILTER BEFORE DISINFECTING

If the water is cloudy



Filter through a clean cloth, paper towel, or coffee filter

OR



Allow it to settle

THEN, draw off the clear water and proceed with the disinfection



2 | BOIL WATER

3 | DISINFECT WITH CHLORINE

If boiling is not possible

Use commercially available chlorine food disinfection solutions or tablets & follow the manufacturer's instructions.



Wait for at least **30 minutes** before you drink it.



If a chlorine product is not available

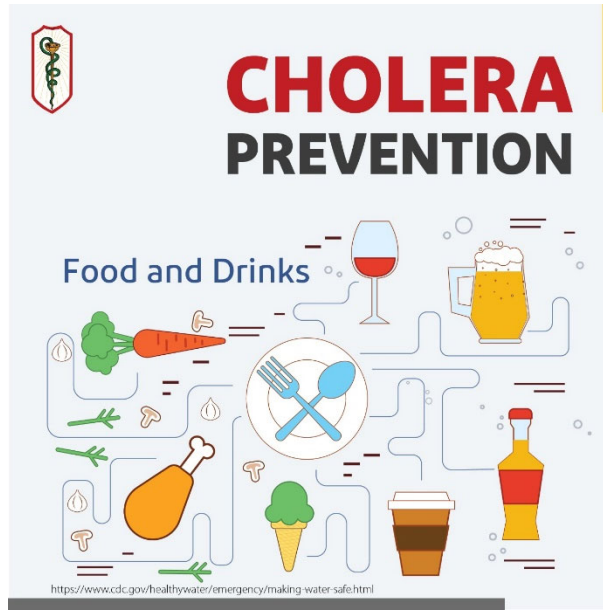
Treat water with household bleach. This technique also applies for sanitizing water tanks.

Bleach Concentration	
<5% (50000ppm)	5 - 10% (50000 - 100000ppm)
Add 0.2mL (4 drops) to 1L of water (200mL/m ³)	Add 0.1mL (2 drops) to 1L of water (100mL/m ³)

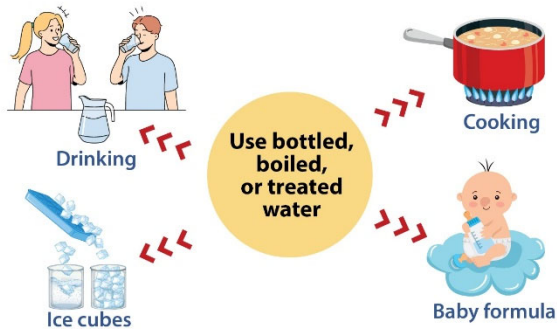


- Wait for at least **30 minutes** before drinking/using.
- If the water is cloudy, double the bleach dose.

4 | DISINFECT WITH HOUSE BLEACH



1 | USE SAFE WATER



Wash and scrub hands with safe water for at least 20 seconds



2 | WASH YOUR HANDS

3 | CLEAN UP SURFACES



Cook Food Well!
(especially seafood)



Peel fruits and vegetables




4 | COOK SAFELY




CHOLERA PREVENTION

Hygiene and Use of Toilets



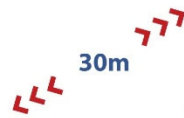
1 | CLEAN UP SAFELY

Where the family



bathes & washes clothes

Use available latrines/toilets



Defecate at least 30 meters away from any body of water

2 | RESPECT THE ENVIRONMENT

Clean latrines/toilets and surfaces contaminated with feces using household bleach

Dilution

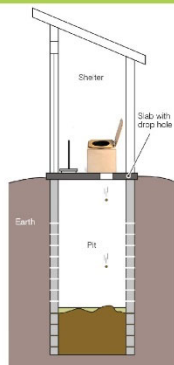
- > 1 part of bleach
- > 9 parts of water



3 | DIG NEW LATRINES

For people living in community and camps

Dig new latrines or temporary pit toilets at least **0.5 meter** deep & at least **30 meters** away from any body of water



4 | CLEAN UP SURFACES