

Cholera is an acute diarrhoeal disease that is caused by some strains of the bacteria *Vibrio cholerae*. This disease is very rare in the United States and other industrialized nations, however, the disease is still prevalent in locations such as Haiti, Southeast Asia, and Africa. In 1563, the first reported case of the disease was documented in an Indian medical report. Global cholera cases have been increasing steadily since 2005, with between 1,300,000-4,000,000 million cases each year. The disease can be lethal if left untreated, but is easily prevented through sanitation and access to clean water. Moreover, an increase in the prevalence of resistant *Vibrio cholerae* in recent years will make treatment and prevention of this disease even more difficult (Mala 1348).

*Vibrio cholerae* is a gram negative, motile, comma-shaped rod bacterium and contains a flagellum at one end along with pili. *Vibrio cholerae* can undergo both fermentative metabolism and respiration, and thus is a facultative anaerobe. The presence of the O-group antigen on the bacterium distinguishes it from other non-virulent members of the family (Finkelstein 1996). Most notably, Cholera is known for its extremely virulent secreted A-B toxin which is secreted from the bacterium and causes the massive watery diarrheal infection (Saadi 1348).

*Vibrio cholerae* is the agent that causes cholera, one of the most prevalent and problematic diseases in many developing nations. The bacterium is transmitted by the fecal-oral route through contaminated food or water caused by poor sanitation, a characteristic indicative of developing nations. The largest epidemics are typically a result of fecal contamination of food or water, however food transmission can also occur by natural contamination of seafood by *Vibrio cholerae*. Once transmitted, the bacterium infects the small intestine and causes massive diarrhea, leading to dehydration of the infected host. Typically, the infection is mild or without symptoms, but about 1 in 10 infected individuals will experience severe symptoms and death can occur within hours without proper rehydration treatment (Barrett 369). This disease is a monumental public health concern with close to 4 million infected each year and rising.

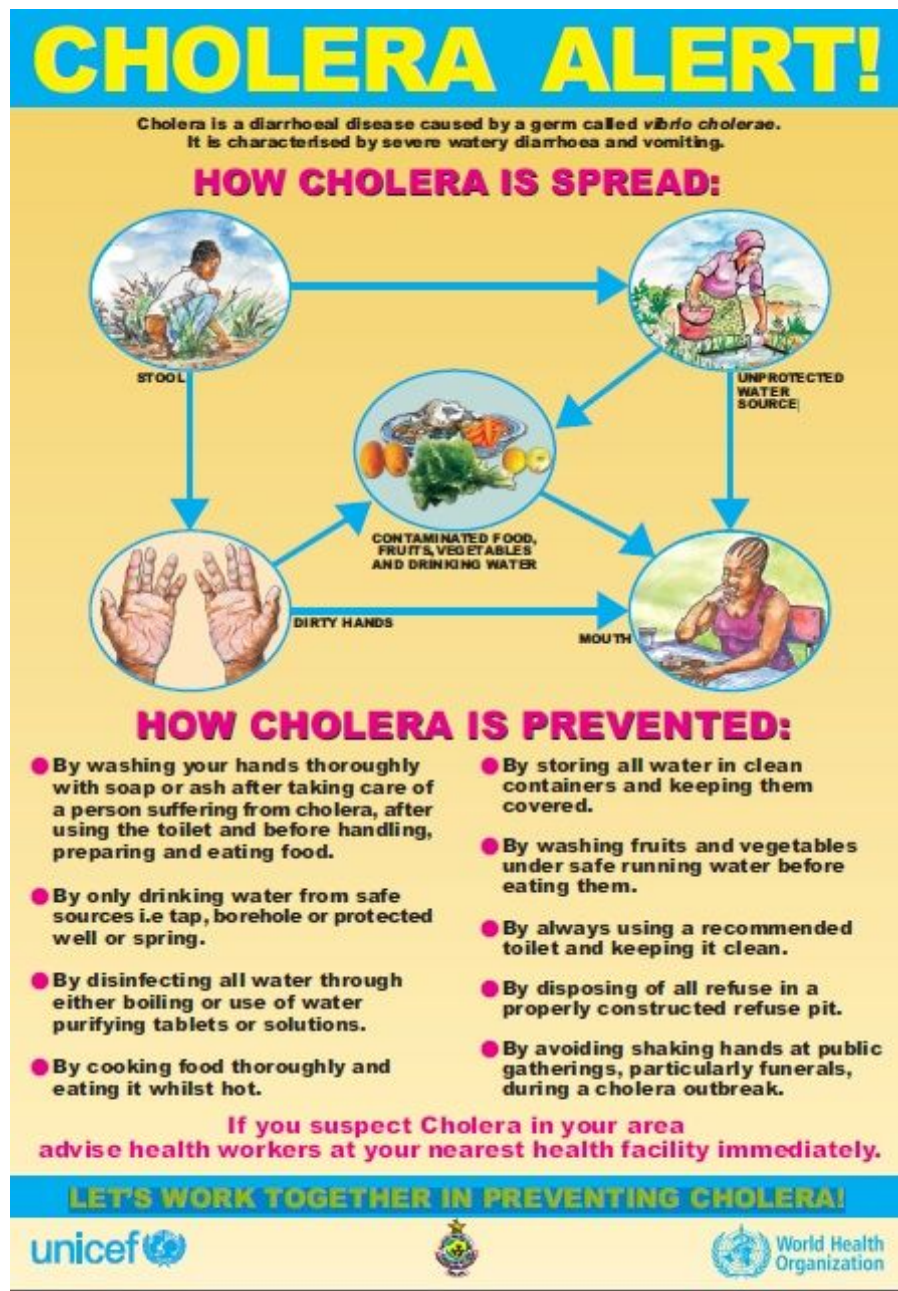
The present strategies to combat cholera infection exist in both medicine and public health. Patients can typically be treated with prompt replacement of fluids and salts lost from the massive diarrhea. In severe cases, intravenous fluid replacement is necessary and less than 1% of patients will die from cholera with rapid fluid replacement. In order to reduce the duration of the disease, antibiotics such as doxycycline and ciprofloxacin are administered, however these drugs

are becoming less effective as resistance has been observed in nearly every class of antibiotics used to treat the infection. In regards to prevention of the disease in endemic areas, bottled water should be used if possible and water should be boiled if it is not. Raw and undercooked seafood should not be consumed, nor should unpeeled fruits and vegetables, as shown in Figure 1 (WHO). Practicing basic hygiene such as frequent handwashing and proper disposal of feces is of utmost importance to prevent the disease (Nguyen 1311). Several safe and effective vaccines are also available, such as Dukoral which is an inactivated whole vaccine, with an overall efficacy of over 60%, but is not available in the U.S. More recently, a single-dose live oral cholera vaccine called Vaxchora is available for those traveling to a cholera impacted area. This vaccine is not routinely administered due to most people not traveling to areas of active cholera transmission. None of the current vaccines available for cholera confer 100% protection (Hauke 612). A rapid dipstick test is available to diagnose cholera and positive samples should be tested for antimicrobial resistance, however treatment typically begins before diagnosis.

Currently, the World Health Organization recently revitalized the Global Task Force on Cholera Control to support the development of a research agenda and increase its visibility as a public health concern. Also, research is currently being conducted to determine the effectiveness of widespread cholera vaccination and if it is financially possible to undergo such a procedure. While an effective vaccine is currently available, there is a chronic shortage of vaccine doses for use in cholera endemic areas. Several epidemiological, political, and logistical challenges are inhibiting the the quick responses needed to cholera outbreaks. In 2015, an outbreak occurred in Juba, South Sudan and due to global shortage of the vaccine, the nearly 1 million at risk people were unable to receive the vaccine (Parker 3099).

Based on current work, more resources and time must be allocated towards improving vaccine administration in active cholera areas. More specifically, organizations such as the WHO and CDC should seek additional funding to supply countries such as South Sudan and India with larger stockpiles of the vaccine to aid in prevention. Moreover, in places where cholera is endemic, public health officials in these areas should provide instruction for how to best avoid being infected. Through increased disease visibility, awareness, and providing rehydration supplies, the number of fatalities caused by cholera can be drastically reduced.

Figure 1.



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