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Cholera & Human Neglect: The Price of Unsafe Water

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ABSTRACT

Cholera is a severe diarrheal sickness caused by *Vibrio cholerae*. It can be transmitted through contaminated food and water, which leads to severe dehydration and life-threatening hypovolemic shock and even death if not treated. Flooding increases disease spread by affecting healthcare systems, contaminating water supplies, and relocating populations. In the 2022 flood, Pakistan faced recurrent outbreaks, which caused widespread destruction to health facilities and enhanced exposure to contaminated water. The prevalence remains high due to poor surveillance, lack of proper sanitation, and limited access to safe drinking water. Risk factors like poverty, malnutrition, unhygienic food, blood type O, *H. pylori* infections, and lack of breastfeeding increase susceptibility. Effective prevention and control strategies necessitate advanced WASH infrastructure, health education, immunization, surveillance, and immediate care with oral hydration solutions (ORS). Reinforcing these public health strategies minimizes cholera-related illness and reduces mortality in endemic areas.

Keywords: *V. cholera*, Malnutrition, Poor surveillance, Dehydration, Colonization, Medical facilities

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Introduction

Cholera, an acute infection caused by *Vibrio cholrae,* is considered a health threat to people in low and middle-income countries. The infection mainly spreads in aquatic conditions, causing watery diarrhea and dehydration, which leads to hypovolemic shock [1]. The appropriate oral intravenous therapy can reduce the fatality rate from 50% to less than 1%. As per WHO reports, it causes 1.4 to 4 million cases and 21,000 deaths every year. The 1960s pandemic is still considered the world's largest pandemic humanity has suffered to date. The Trigger Module (TM) and Transmission component (TrM) are the main factors responsible for the disease spread. The TM includes mechanisms that help in reproduction and spread of *V. cholerae* in nature. When TM shows favorable conditions for high number of V. cholerae and poor WASH infrastructure, there is increased contact with humans and bacteria. The essential model of TrM is that humans can speed up the transmission of cholera through intestinal colonization and excretion of cholera bacteria into the environment. Under advantageous situations, the microbe grows and can contaminate individuals via the feco-oral transmission route [2].

Public Health Crises

Floods lead to the demolition of healthcare infrastructure, limited access to existing facilities, shortages of medical supplies, and limited availability of healthcare facilities [3]. Since June 2022, in Pakistan, 1460 healthcare facilities have been damaged, and almost 24,000 schools were affected, with 5,000 used as relief camps. In Pakistan, disparities between rural and urban settings have been constant. This inequity hinders healthcare efforts to address the health needs of the rural population affected by the current floods. Floods have a destructive effect on individual health. Instant health crises such as hydrophobia, hypothermia, burns, drowning, injuries, electrocution, and carbon monoxide poisoning. Flood can increase non-communicable and communicable diseases like cholera, tuberculosis (TB), malaria, dengue, hepatitis, and polio that might lead to death. Cholera is a critical public health issue even in those areas of the world where there is poor sanitation and less access to clean water. The main reason outbreaks occur during floods is floodwater mixed with human waste, garbage, and other pollutants, allowing the bacteria to spread rapidly.

Public health strategies to prevent, control, and treat cholera infection are hygiene improvement, supply of clean drinking water, ensuring food safety, provision of proper sanitation facilities, surveillance, and vaccination [4]. WHO and UNICEF recommended ORS for cholera patients. It is safe, reduces hypertonicity, and decreases stool output. These strategies would help decrease the burden of illness, prevent the spread, and eliminate this disease as a risk in endemic areas.

Epidemiology and Burden of Cholera

In developing countries, it is observed that the burden of cholera has enhance and become a critical public health issue. In the past, cholera remained endemic in the Asian subcontinent, but it is now endemic in Africa, Latin America, and the Caribbean. Due to poor or absent surveillance systems, many settings do not report their morbidity and mortality. In different regions of Bengal and Africa, epidemics occur during the rainy season. Cholera cases occur frequently in Pakistan due to poor hygienic conditions [5]. In 2022, 3,70,000 cases were suspected due to natural disasters like floods. In the period between January 2023 and July 2025, 21000 cases were suspected, and 250 cases confirmed annually.

Risk Factors

Cholera-acquiring risk factors are linked with poverty, contain insufficient sanitation, contaminated drinking water, and unhygienic food handling (e.g., street foods). Hand-washing with soap before and after meals can reduce the risk of cholera. Some biological and health issues can increase the risk of severe suffering from cholera, like female gender, blood group O, retinal deficiency, and hydrochloride. Additionally, *Helicobacter pylori* infection and mastectomy also lead to severe disease. Malnutrition increases vulnerability mainly among young children. In endemic areas incidence of cholera is particularly highest in children less than 5 years of age because they have lower immunity than adults.

Secretory immunoglobulin A (SIgA) in maternal milk secure infants from cholera; that's why solely breastfeeding for the first 6 months is suggested for women in cholera-endemic areas. Long palate, lung, and nasal epithelium clone protein 1 (LPLUNC1) is shown in Paneth cells of the gut. It regulates host inflammatory responses to *V. cholerae* infection and affects disease severity. Enterotoxigenic *E. coli* or parasites increase the risk of infections [6].

Conclusion

Cholera remains a major cause of morbidity and mortality, particularly among vulnerable populations all over the world. According to literature and research, cholera is endemic in Pakistan as well as other countries of the Asian subcontinent, Africa, Bengal, Latin America, and the Caribbean. These countries should address risk factors of cholera and improve hygienic measures, their healthcare infrastructure, and ensure equity and equality. They should maintain a proper surveillance system, reduce barriers to vaccination, and introduce telemedicine to combat cholera.

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