Chapter

Introductory Chapter: Perspectives of Recent Advances in Research in Acute Diarrhoeal Diseases

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1. Introduction

Acute diarrhoea is defined as frequent passage of loose or watery stools mixed with mucus and causes morbidity and mortality particularly in children. The scope of the book is to present information on acute diarrhoeal diseases in relation to clinical features, dehydration, management and prevention. When the stool contains blood, it is called dysentery. Acute diarrhoea is an ancient problem with tremendous public health significance. Acute diarrhoeal diseases comprise of acute watery diarrhoea and acute bloody diarrhoea (dysentery). The prototype of acute watery diarrhoea is cholera, while the same for dysentery is shigellosis. It caused extensive epidemics during flood, famine, war and earthquake when large number of people is shifted to refugee camps.

2. Disease burden

According to an estimate [1] by the World Health Organization, 3–5 million cholera and cholera-like cases occur worldwide, and 100,000–120,000 million cases die with a case-fatality rate of 2.25% (range 1–10%). This figure is actually grossly underestimated, because of under-reporting. These diseases, under the overarching syndrome of acute diarrhoea, cause tremendous pressure on the healthcare delivery system, and during epidemics and pandemics, this is compounded as a real public health problem. There have been seven pandemics (epidemic all over the world) of cholera which spread to more than 102 countries worldwide and killed millions of people.

3. New strain *Vibrio cholerae* O139

An unprecedented happening occurred in the epidemiology of acute diarrhoea [2] when a novel strain of *Vibrio cholerae non* O1 was found to produce an exotoxin akin to cholera toxin and caused large-scale epidemics. The stain was named as *Vibrio cholerae* non O139 Bengal because the strains were isolated from the coastal region of the Bay of Bengal. The disease caused by this stain was indistinguishable from O1 cholera. The same strain of *Vibrio* was isolated from the UK, Germany, the Netherlands, Nepal, Bhutan, Indonesia and Japan. This was thought to be the beginning of eight cholera pandemic, but this actually did not happen so.

4. Etiology

Acute watery diarrhoea comprises of about 20–25 pathogens which fall under the categories of bacterial, viral and parasitic agents. The bacterial pathogens causing diarrhoea include *Vibrio cholerae* O1 and O139, enterotoxigenic *Escherichia coli*, *Vibrio parahaemolyticus* and *Salmonella*; the viral pathogens include *Rotavirus* and *Norwalk virus*; the parasitic agents include *Entamoeba histolytica*, *Giardia lamblia* and *Cryptosporidium*. *Shigella* and *Campylobacter jejuni* cause dysentery. *Rotavirus* is a diarrhoeal disease, which affects children aged between 6 months and 2 years. Early vomiting is an important symptom of *Rotavirus* diarrhoea. Children suffering from *Rotavirus* diarrhoea occupy about 40% of beds in a children hospital.

5. Cholera toxin and dehydration

Vibrio cholerae O1 and O139 produce an exotoxin known as cholera toxin (CT) [2]. CT attaches to gut mucosa and helps in outpouring of fluid and electrolytes, and when the fluid loss exceeds the absorbing capacity of the colon, watery diarrhoea ensues. This leads to a condition called dehydration. Classically, dehydration is categorized as mild, moderate and severe dehydration. Other scoring methods of dehydration have been proposed and will be useful.

6. Management

The treatment of acute diarrhoea is based on the correction of fluid deficit and replacement of ongoing loses. Mild and moderate dehydration can be corrected by oral rehydration therapy [3–6] using oral rehydration salt solution. On the other hand, intravenous fluid is required for the management of severe dehydration. The WHO recommended ORS containing sodium chloride of 2.5 g, potassium chloride of 1.5 g, sodium bicarbonate of 2.9 g and glucose of 20 g dissolved in 1 L of drinking water. ORS is given slowly particularly in children. If vomiting occurs, one has to wait 5–10 minutes and again start giving ORS very slowly. Recently, hypo-osmolar ORS has been recommended. On the clinical aspect of acute diarrhoea, new scoring method has been suggested. It has been reported that epileptic seizures are a manifestation of acute diarrhoea. This is a new area where lots of research may be done.

7. Role of antibiotics

Antibiotics are used in the treatment of acute diarrhoea only for severe cholera and shigellosis. Antibiotic therapy reduces the duration of diarrhoea/dysentery and hastens recovery. The antibiotics of choice for cholera are tetracycline or single dose (300 mg) of doxycycline. Norfloxacin and ciprofloxacin are effective. Herbal medicines may be effective in the treatment of acute diarrhoea. This mode of therapy will be cheap and safe.

8. Drug resistance

Drug-resistant strains of *Vibrio cholerae* have been reported. Shigellosis is treated by various antibiotics including ampicillin, co-trimoxazole, and the fluoroquinolone. However, multiple drug resistance is a huge problem and poses

as a therapeutic challenge. The drug resistance is particularly seen in *Shigella dysenteriae* type 1 strains. These strains produced large-scale sporadic, epidemics and pandemic. The drug-resistant shigellosis epidemic that occurred in Bangladesh and Central America caused large morbidity and mortality. A number of complications have been reported in association with *S. dysenteriae* type 1 including hemolytic uremic syndrome (HUS) characterized by hemolysis, renal failure and thrombocytopenia.

9. Prevention

Prevention of acute diarrhoea is a formidable challenge. These include sanitation, safe water and handwashing. Vaccination is an attractive disease prevention strategy. Health education plays a crucial role in the adoption of the strategy, particularly handwashing. This should start at the preschool level to form a habit in later life. Vaccination is an attractive disease prevention strategy. Recently, an oral cholera vaccine has been developed which has been found to protect up to 66% people among those vaccinated [7]. Vaccines against *Rotavirus* are available.

10. Final words

Finally, this book comprises of chapters of topics, which have significance in relation to clinical feature, dehydration, and management and prevention of acute diarrhoea. The reader will find the topics new, informative, and interesting.

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