



## Cholera and the Control of Diarrhoeal Diseases

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Cholera has long been recognized as the most devastating and fatal diarrhoeal disease. In its epidemic form, it has decimated entire populations. The current 7th Pandemic, now some 30 years of age, has brought sporadic outbreaks, usually involving relatively small numbers of cases, to some ninety-six countries, spreading from Asia to Africa, Europe, and even, in isolated cases, to the Americas and Australia (figure 1). The global total of reported cases

greater effect on the overall public health than on cholera alone. Since the work of De and colleagues in Calcutta in the 1950s, the discipline of "diarrhoeology" has become an established reality with standardized methods and approaches and, perhaps more important, a cadre of investigators committed to the understanding and control of the complex disease process manifested as diarrhoea. Microbiologists, physiologists, immunologists, epi-

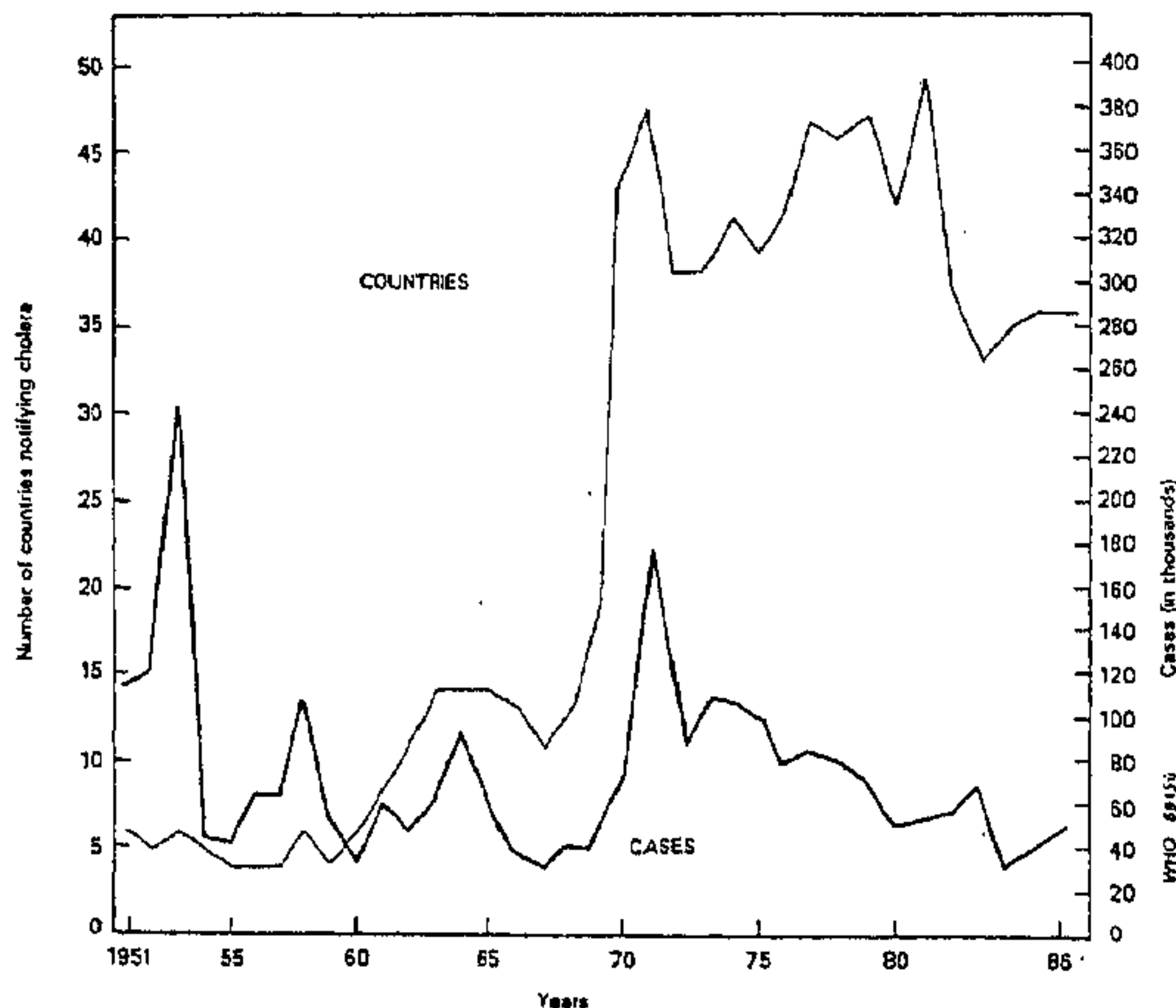


Figure 1. Incidence of Cholera and Number of Countries Notifying Cases, 1951 - 1986.

has been progressively declining from a peak level of 178,000 cases in 1971 to 38,000 in 1987. Even were these figures to represent only ten percent of actual cases, cholera contributes a small proportion of the estimated global death toll of 5 million lives annually from all forms of diarrhoea.

The study of cholera, its epidemiology, pathophysiology, and clinical management has had far

demiologists, clinicians, and even social scientists have formed multi-disciplinary teams addressing the wide array of scientific and socio-cultural factors which together comprise the spectrum of diarrhoeal illness. Indeed, entire institutes dedicated to the study of this illness, most notably, the Cholera Research Laboratory (now the International Centre for Diarrhoeal Disease Research in Bangladesh),

have brought international investigators together to address these problems. From an initial foundation and interest in cholera they embrace today the entire spectrum of diarrhoeal illness.

The study of cholera toxin, its isolation, characterisation, and genetic coding, have led to an understanding of the toxins found more widely in *E. coli*, *Shigella*, and to the study of mechanisms of many non-toxin producing diarrhoeas, notably the more recently discovered rotavirus. The epidemiologic methods which demonstrated the large inapparent infection rate of cholera, its spread through water, and the characteristics of immunologic response in individuals and communities have led to similar methods of investigation in diarrhoeas of wide and varied etiology. Perhaps, most important of all, investigation into the clinical management of cholera led to the development of oral rehydration therapy (ORT), described by many as the "medical breakthrough of the century". ORT has become the basis on which to attack a hitherto bewildering array of disease entities of unknown etiology and complexity, for it is universally effective and readily utilized in the most primitive of circumstances. Indeed, it was the development of ORT which led WHO to establish the Control of Diarrhoeal Diseases programme in 1979 with case management strategy based on ORT as its central feature. Additionally, during the past decade, under WHO, there has been an expansion of research into a wider range of issues ranging from etiology to nutritional consequences of diarrhoea and immunology leading to the development of vaccines and effective preventive measures. Hundreds of investigators in scores of institutions have been trained, encouraged and supported in their work on diarrhoeal illness. A specialty journal (*Journal of Diarrhoeal Diseases Research*) and numerous international conferences and meetings, as well as WHO disseminate the results of this rich array of investigation.

Today, diarrhoeal disease control is a major element of the primary health care strategy in over 100 WHO member countries throughout the world. WHO estimated that over 60 percent of the developing world population now has access to ORS packets and a trained health worker. Last year, fully one-third of an estimated 1,000 million diarrhoea cases were treated with ORT, resulting in 1 million deaths prevented annually from use of this simple and affordable technology. Far more than the total toll of

cholera deaths in the worst years, the lives saved annually from the common and ubiquitous diarrhoea amongst children are a result of the efforts of investigators and institutions around the world, dedicated to an understanding of cholera and related illness. While cholera is still found in endemic foci in some 30 countries, fewer than 50,000 cases were reported annually through the last decade, with case fatality rates generally less than 10 percent. Cholera accounts for 1 percent or less of all diarrhoea deaths.

New areas of research, not critical or exceptionally relevant to cholera control characterize the frontiers of diarrhoea research. Nutritional effects of diarrhoea are profound, particularly in persistent or chronic cases, and practical management of this increasingly large proportion of fatalities is still elusive. Persistent diarrhoea, associated with malnutrition may now account for as many as one-half of all 4-5 million annual diarrhoea deaths. The clinical management of these difficult cases is far from standardized and will require effective interventions to prevent and treat malnutrition afflicting over 300 million children today. Dysentery, not only due to shigella, is also a more prominent group of diarrhoeal deaths as the "simple" acute watery diarrhoeas are increasingly well treated by ORT. The advances in immunology accorded by the new techniques of molecular biology offer an array of immunoprophylactic measures that should make prevention of diarrhoea cases through vaccines a practical reality within the decade. Vaccines against Rotavirus, *Shigella*, and various types of *E. coli* are already in field trials, joining the improved oral cholera vaccines as prospective means to reduce the heaving burden of childhood illness. The rising interest of behavioural scientists in the associated social factors which underlie both incidence and the clinical course of diarrhoea provides a broad array of interventions to better control diarrhoea and its consequences.

Much remains to be learned, but much progress has indeed occurred, and the challenge of the moment is to apply what is known and shown to work for cholera, to all diarrhoeas in order to remove this unnecessary cause of death and malnutrition from the list of major public health problems in the world.

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