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Communicable Diseases and Epidemiological Surveillance After Sudden Natural Disasters

During the last decade, disasters from all causes have stirred growing interest among the authorities and the public in the stricken countries and in scientific quarters. This rebirth of interest is unquestionably due as much to the brutality and spectacular nature of major disasters, which have triggered international concern, as to the increasing risk of disasters in most developing countries * These hazards are associated with expanding population settlements in areas under threat from natural disasters such as floods, earthquakes and hurricanes The rapid urbanization of many countries inevitably increases the number of victims and the potential amount of damage in future disasters.

The problems raised by these and other disasters are many and varied. Health problems are only one, and often not the most important, aspect of a complex situation. In disasters, confusion, if not actual chaos, and a lack of objective health information and unsubstantiated rumours, make up the general background from which vital and far-reaching decisions have to be determined.

Hearsay reports of imminent outbreaks of communicable diseases rapidly reach the epidemiological services of the government and, unfortunately, the mass media which is too often ready to amplify indiscriminately the concerns of the population traumatized by the natural disaster.

In this chapter the risk of increased incidence of diseases following disasters will be analyzed, the principle of epidemiological surveillance under emergency conditions will be outlined and appropriate control measures proposed. The analysis will be limited to natural disasters such as earthquakes, hurricanes, tornados, floods and volcanic eruptions.

The problems for countries afflicted by chronic famine or protracted conflicts, when acute clinical malnutrition and total disruption of the public services occurring as a consequence of a sudden disaster add a new dimension to the already dismal situation, will also be considered briefly.

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* In 1985 alone, catastrophic earthquakes devastated Chile on 3 March, when 150 people were killed and 2000 injured, and Mexico City, where an estimated 10 000 persons died or were reported missing following the seisms of 18 and 19 September Over 420 buildings totally collapsed and 5000 hospital beds were instantly destroyed (Source Epidemiologia, Boletin Mensual, Mexico, Vol 1, 1 enero 1986, p 5)

In Colombia, the dormant volcano Nevado del Ruiz brutally erupted following several weeks of precursory seismic activity and mild emissions of ashes and gas The moderate-sized eruption of 14 November 1985 caused the thawing of an estimated 5 7 per cent of the glacial ice cap Forty-five minutes later, the mudflow obliterated the city of Armero, resulting in a death toll of 23 000

RISK FACTORS FOR INCREASED INCIDENCE OF COMMUNICABLE DISEASES FOLLOWING DISASTERS

An epidemic is generally defined as the occurrence of cases in greater number than normally expected. In the special and emotional context of emergency situations when dead bodies are counted by thousands, we will reserve the use of the term 'epidemic' or 'outbreak' for a sudden and geographically-defined occurrence of a large number of cases—a definition more akin to that accepted by the general public, the press and the politicians. The term 'increased incidence' will be used otherwise.

Undeniably, disasters, in the absence of preventive and corrective measures, can favour the transmission of certain diseases. The major plagues of earlier centuries were often associated with natural disasters. There are three ways in which an increased incidence can be triggered by a disaster: by the increased transmission of local pathogens, by a change in the receptivity of the population and by the introduction of a new specific pathogen into the environment

Enhancement of Transmission

Disasters may increase the transmission of communicable diseases by a wide variety of devices: (*a*) an increase of promiscuity, (*b*) a deterioration of environmental health and (*c*) a partial or total disruption of control programmes. To judge the extent to which these factors are affected by a disaster, it is necessary to know the situation prior to it. In developing countries, the scarcity of baseline data on environmental health services and the lack of effective immunization coverage associated with widespread disease may lead inexperienced relief medical personnel or researchers to blame a natural disaster for chronic problems in the health situation erroneously.

Promiscuity most often increases when temporary settlements quickly become overcrowded, resulting in 'outbreaks' of scabies and lice and flea infestations. The sanitation and administration problems that inevitably arise, and the tendency of such camps to become permanent, are some of the many reasons for the authorities to avoid encouraging their establishment (*Fig.* 18.1).

Deterioration of sanitary conditions in the environment is the most important factor and the one most responsive to energetic action. The potential impact of the disaster on health is determined by the level of sanitation prior to the disaster. If there is no sanitary infrastructure, no water supply network, no sewage system, and personal hygiene is poor, a natural disaster can hardly aggravate the existing situation. At the other extreme, an urban area where sanitation services are strained to the limit of their capacity by population growth is particularly vulnerable.

Water Supply

The most critical and best known environmental factor is the provision of water. A few commonsense observations are worth stating:

1. People will need and seek to obtain the basic amount of water regardless of its quality, cost, time or the legal considerations to acquire it.
2. A supply of bacteriologically safe water is a priority for relief personnel,

Fig. 18.1. Overcrowding and the lack of basic sanitation in temporary settlements is a major fact
in the incidence of communicable diseases following disasters.

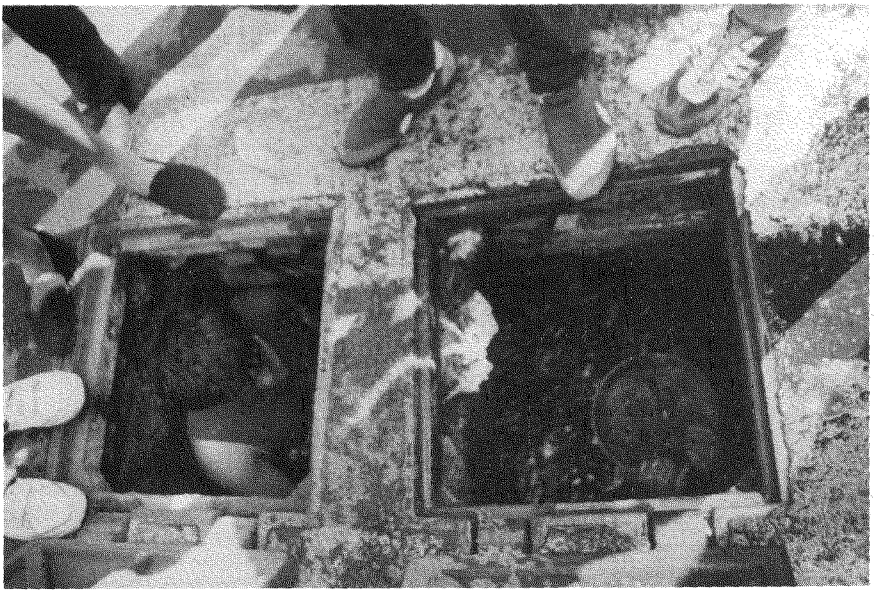

Fig. 18.2. Unsafe break-in into the main water pipe following the earthquake in Mexico, 1985.

health authorities and a small educated segment of the population in developing countries.

3. Short-term (days/weeks) emergency measures to provide drinking water to large populations are a logistical nightmare and extremely expensive. Each natural disaster may affect the amount of drinking water available in a distinctive manner.
4. Direct physical damage to water plants and distribution networks is common following earthquakes. Leak detection and emergency repair became a top health priority immediately after the initial treatment of mass casualties following the well-studied urban earthquakes in Nicaragua (1972), Guatemala (1976), Chile and Mexico City (1985) (*Fig.* 18.2). Similar shortages of drinking water were reported following floods (Jamaica, June 1986) and mud flows (volcanic explosion of Nevado del Ruiz, Colombia, 1985).
5. Indirect effects such as lack of electricity or failure of key staff to report for duty are both common following any large scale catastrophe, and have caused water shortages, usually of short duration.
6. A large population increase in the areas served by an existing (and intact) water supply system is the direct consequence of migration towards urban centres. The formal establishment of temporary settlements/refugee camps will not be considered in this chapter.

In relief operations or emergency situations, the quality of the water is not the issue. What matters is the potential *change* in water quality experienced by the population as a consequence of the natural disaster or subsequent population movements.

Earthquakes affecting areas with water and sewage systems increases the possibility of cross-contamination. However, daily bacteriological monitoring of water samples following the earthquakes in Latin America did not reveal any massive water contamination.

It is accepted that the flooding of wells or other water supply sources may lead to an increased incidence of water-borne disease. However, hard data and research results are scarce on the magnitude of the problem. The possibility of a beneficial dilution of pathogens following heavy flooding or tidal waves (e.g. Bangladesh 1970 and 1984) in densely populated rural areas cannot be discarded.

Outbreaks of leptospirosis caused by direct contact with water contaminated by infected animal urine has been reported following floods in Portugal (1967), Amazonia, Brazil (1973) and Jamaica (1979).

Food Hygiene

In the past, increased incidence of disease has been attributed more to poor hygiene of relief foods than to contaminated water supplies. Small outbreaks of mass food poisoning are commonly reported among victims and relief personnel in the aftermath of earthquakes or other natural disasters.

Vector and Rodent-Related Diseases

The importance of vector-related diseases following natural disasters is well summarized by the Pan American Health Organization.[1] Mosquito-borne diseases, especially malaria, dengue and arboviral encephalitis, eventually cause significant concern after disasters associated with heavy rain and flooding. The immediate effect is, however, the destruction of larval habitats and a reduction of the vector population with the secondary creation of new larval habitats. It is difficult to determine the probability that greater adult densities will be produced in these habitats and whether an increase in disease transmission will occur subsequently.

Vector-related diseases such as endemic typhus and certain rickettsial diseases, will be of concern when they are already endemic in or near a disaster area. In addition, fly, cockroach, bedbug, human louse and rodent infestations may pose problems. Immediately after a natural disaster, the fly and rodent densities may appear to be greater, either because they become more visible or have indeed really increased. This is partly due to disruption of sanitary services, such as garbage collection and disposal, and also because human overcrowding is accompanied by an increase in the numbers of rodents and other vermin seeking the same sources of food and accommodation.[1]

One of the best documented examples of a vector-born outbreak occurred in Haiti in 1963 when hurricane Flora struck shortly after households had been sprayed with DDT in the malaria eradication campaign. The availability of breeding sites, the destruction of homes protected by the insecticide and migration of the population helped to cause an explosive epidemic of malaria from Plasmodium falciparum (more than 75 000 cases were reported). A resurgence of malaria with high mortality has often been seen following the rains ending a prolonged period of drought.

Other examples include the dramatically increased incidence of malaria following major floods in Ecuador and Peru

The extensive rains and consequential flooding which characterized the El Niño phenomenon during 1982–3 along South America's Pacific coastline created an ecological environment which favoured the spread of malarial diseases into susceptible geographical areas.

In Peru the northern provinces of Piura and Tumbes suffered the heaviest rains. In 1983 alone, 11 075 new cases of malaria were recorded there. The number of cases reached a peak in September and October registering a figure 7 times greater than the average between 1976 and 1982.[2]

The simultaneous flooding which occurred in Ecuador encouraged a similar situation. Not only were new breeding places for mosquitos created but many carriers and potentially susceptible people moved out of rural areas into areas where malaria was already endemic, creating suitable conditions for additional outbreaks, such as those which occurred in Guayaquil. The incidence of malaria in Ecuador's coastal area jumped from 4000 registered cases in 1982 to 28 000 cases in 1984.[3]

Corpses

Other factors may exist but often they are given exaggerated importance· the public and the administrative authorities seem under a misapprehension concerning the part played by corpses in the transmission of diseases. Examples abound in which the press and television have evoked the spectre of cholera, typhoid fever or plague epidemics, to which the population is supposedly