PMCare Capsule

We Manage Because We Care

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Cover Story

Bencana Alam dari Sudut Perubatan

Features

Natural Disaster & Infectious Diseases

Communicable Diseases Associated with Natural Disasters

Prevent Illness after a Disaster

Handling of Human Remains from Natural Disasters

Types of Natural Disasters

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Capsule Theme

Diseases from Natural Disasters

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Bencana Alam dari Sudut Perubatan

Baru-baru ini, tentu ramai di antara kita merasai gegaran pada bangunan yang kita duduki, sama ada bangunan pejabat ataupun rumah masing-masing. Gegaran itu berpunca dari gempa bumi yang berlaku di Padang, Indonesia iaitu lebih kurang 500 km dari Lembah Klang. Khabarnya ramai diantara kita yang panik dan ada yang berlari turun ke tanah rata kerana risaukan risiko bangunan runtuh.

Tahukah anda, pada jam 5.16 petang 30 September 2009, gempabumi berukuran 7.6 (pada skala moment magnitude scale) Padang yang terletak hampir dengan “ground zero”, bagaikan bumi terbelah pelbagai arah? Banyak bangunan tumbang seolah-olah ia dibina dari kotak-kotak mancis!

Bagi mereka yang melalui keadaan itu, ianya memang menakutkan. Ada pelajar-pelajar kita yang belajar di Universitas Andalas yang mengalami trauma dan berada dalam ketakutan sehingga ada yang tidak sanggup ke sana menyambung pelajaran.

Begitulah hebatnya bencana alam yang boleh sahaja berlaku bila-bila masa dengan intensiti yang berbagai. Ancaman ini membuat kita terasa betapa kerdilnya kita bila berhadapan dengan sesuatu yang luar dari kawalan kita. Selain dari kejadian gempabumi di Padang, beberapa kawasan di sekitar Benua Asia juga dikejutkan dengan bencana alam seperti banjir kilat, puting beliung dan juga tanah runtuh.

Dalam istilah perubatan, sesuatu ancaman yang terhasil dari malapetaka boleh dikategorikan sebagai:

1. Ancaman semasa kejadian;
2. Ancaman selepas kejadian

Menghadapi ancaman semasa kejadian

Ancaman semasa kejadian bergantung kepada kejadian yang berlaku ketika itu.

Dalam kejadian bangunan runtuh, seseorang boleh tercedera atau terbunuh akibat dihempap serpihan bangunan secara langsung. Mereka yang tercedera perlu diselamatkan dan diberi bantuan segera bergantung kepada tahap kecederaan yang dialami.

Ada juga yang terperangkap di bawah runtuhan bangunan dan nyawa mereka bergantung kepada berapa lama mereka boleh bertahan sehingga mereka ditemui dan seterusnya diselamatkan. Jika mereka berjaya dikesan, cabaran utama adalah menyalurkan bekalan udara, air dan makanan dan bantuan perubatan asas jika diperlukan sementara menunggu mereka dibawa keluar dengan selamat.

Dalam kejadian banjir, ancaman utama ialah lemas akibat dihanyut air bah. Bekalan air bersih terganggu. Keadaan menjadi sukar jika mangsa menggunakan air yang tidak dimasak dengan betul. Jangkitan penyakit air (water-borne disease) menjadi ancaman utama yang dihadapi oleh mangsa banjir dan pasukan bantuan perubatan.

Ancaman sebegini biasanya ditangani oleh pasukan bantuan perubatan atau ”Emergency Relief Team” yang dibentuk oleh sepasukan doktor dengan bantuan paramedik untuk menangani situasi kecemasan bermula dari bantuan asas kecemasan (First Aid) sehinggalah kepada yang melibatkan kepakaran pembedahan terutama rawatan patah tulang dari kecederaan berat.

Menghadapi ancaman selepas kejadian

Gegaran gempabumi hanya untuk beberapa saat tetapi kesannya memakan masa berbulan-bulan malah bertahun-tahun. Dari sudut perubatan, kesan lepas kejadian boleh dibahagi mengikut jenis ancaman yang timbul dari kemusnahan infrastruktur sedia ada sehingga membawa kepada kekurangan berikut:

a) bekalan air bersih
b) bekalan makanan berzat
c) penjagaan kesihatan khususnya untuk kaum ibu dan kanak-kanak
d) penjagaan kesihatan penyakit-penyakit kronik dan
e) kawalan penyakit berjangkit

Petugas-petugas bantuan perubatan akan mengambil pendekatan yang boleh dikategorikan seperti berikut:

a) Pembangunan (semula) Kemampuan Penjagaan Kesihatan;
b) Memperkasaan penjagaan kesihatan ibu dan anak;
c) Memastikan bekalan air bersih dan perkumuhan serta kebersihan am (Clean water, sanitation and hygiene); dan
d) Penyediaan sokongan kesihatan mental

Pembangunan (semula) Kemampuan Penjagaan Kesihatan melibatkan aktiviti mendirikan semula pusat-pusat kesihatan setempat dan juga pusat-pusat kesihatan bergerak (mobile) untuk memberikan perkhidmatan penjagaan kesihatan kepada penduduk setempat dan juga untuk mereka yang datang memberi bantuan.

Ibu-ibu mengandung atau yang menyusu serta golongan kanak-kanak adalah mereka yang lebih memerlukan perhatian. Usaha yang lebih menjurus kepada keperluan mereka haruslah diperkemaskan lagi untuk memastikan masa depan mereka yang terlibat dengan bencana alam terpelihara.

Penyempurnaan penyampaian Bekalan Air Bersih dan pemulihan sistem Perkumuhan adalah penting untuk mengelak dari tercetusnya wabak penyakit berjangkit serta ancaman kesihatan lain. Pelbagai system penapisan air setempat boleh diwujudkan dengan cepat. Malah baru-baru ini, telah wujud kemampuan untuk mengedarkan kit pembersihan air berbentuk straw minuman yang mampu menapis air untuk minuman dengan selamat.

Langkah-langkah Kebersihan Am seperti kebersihan setempat dengan pembuangan bahan buangan seperti sampah sarap juga tidak kurang penting dalam memastikan kesejahteraan bagi mangsa bencana alam ini.

Perlu diingatkan mangsa bencana alam terutama mereka yang kehilangan kaum keluarga dan harta benda menghadapi trauma yang mendalam. Pasukan Bantuan Perubatan dengan bantuan penduduk setempat perlu mempunyai pelan tindakan bagaimana mengurangkan beban trauma ini dengan menyediakan pelbagai langkah mengukuh jaringan sokongan ubat-ubatan dan juga sokongan emosi untuk mereka yang mengalami tekanan mental secara berpanjngan.

Bantuan Perubatan melalui Pasukan Sokongan Perubatan Sukarela

Terdapat beberapa badan sukarela, sama ada dibentuk kerajaan atau bukan-kerajaan – yang sering menghulurkan bantuan kepada mangsa bencana alam di merata dunia. Persatuan Bulan Sabit Merah, International Medical Corp dan Doctor Without Borders sering disebut dalam usaha-usaha begini. Di tanahair pula kita banyak mendengar tentang MERCY MALAYSIA yang bergiat cergas di serata dunia. Ada juga beberapa badan sukarelawan yang menggunakan pelbagai perantara dan cara untuk turut membantu mangsa bencana.

Kami di PMCare turut sama membantu melalui rangkaian pembekal khidmat perubatannya yang luas dengan cara menghulur derma untuk disalurkan kepada mereka yang memerlukan. Walaupun agak usaha gigih kami ini agak kecil, namun sedikit sebanyak diharap dapat membantu dan mengurangkan penderitaan mangsa bencana secara tidak langsung.

Jika anda terdorong untuk turut membantu seperti kami, hubungilah kami di PMCare Sdn. Bhd. Kami sebagai pengurus kemudahan kesihatan secara luhurnya terpanggil untuk membantu dan di atas daya usaha ini kami berharap dapat memberi inspirasi kepada anda semua untuk melakukan sekadar apa yan g dapat kami lakukan.

"We Manage Because We Care"

Natural Disaster & Infectious Diseases

A natural disaster not only brings suffering at the time it strikes, but afterward too in the form of **infectious disease.** The agents of infectious disease find favourable conditions after a catastrophe and can easily spread if nothing is done to prevent them. Unfortunately, in the chaotic time after disaster strikes, disease prevention can prove difficult for those who do not understand what they are up against and how to protect themselves.

Shelters

It is easy for infectious disease to spread in a shelter. Lots of people are in close proximity during a time that challenges the ability practice normal hygiene, with strained bathroom facilities, and diaper changes occurring in close quarters. Other challenges may include finding fresh clothes and laundry facilities and disposing of trash. It is not uncommon for people in group shelters to suffer diarrhoea, nausea and respiratory illnesses.

Water Contamination

Natural disasters that involve flooding can produce contaminated water that in turn can produce infectious disease, including fatal ones. Bacteria and parasites might infect water and breed within it. Sewage, animal faeces and dead animals might also have fouled the water. Unfortunately, during times of flood, stranded people often find themselves forced to come in contact with such water, having to swim or wade through it to escape. Additionally, cleaning up after the disaster means handling items that may have soaked in contaminated water.

Risk

In some areas, the risk of certain types of infectious disease after a natural disaster is less than in other areas. For instance, according to the Centres for Disease Control and Prevention, widespread infectious disease outbreaks after a hurricane are uncommon. Additionally, diseases such as cholera and typhoid are uncommon in developed countries. For these to break out after a disaster, the bacteria have to already present in the area.

Diseases

Parasites, viruses and bacteria all can cause illness after disasters. Parasites include those causing cryptosporidiosis and giardia, both are diarrheal sicknesses. Bacterial illnesses include sickness from E. coli, leptospirosis, which can cause liver failure and kidney damage. Legionnaires' disease, which reproduces in warm, stagnant water, the kind of water trapped in water systems that stand unused after natural disasters. Infectious viruses include the rotavirus, which causes acute diarrhoea; the norovirus, which causes acute gastroenteritis and the enterovirus, the second most common virus after the one that causes the cold.

Prevention and Safeguards

If you are unsure of the purity of water, it is best to assume it is unsafe. Water must be boiled or treated with iodine or chlorine before using it to clean, cook with or drink. Fully cook the food and prepare it yourself. Wounds need to be cleaned as soon as possible and care should be taken to avoid new ones. Hygiene is one of the best infectious disease preventions. Use warm water when you can. Wash hands in water that has been disinfected or boiled, especially before handling food, after going to the bathroom and being in cleanup areas or handling items that may have been exposed to contaminated water. If water is not available, use alcohol-based products to clean your hands. Be aware that standing water breeds mosquitoes, responsible for spreading diseases like the West Nile virus, Dengue etc.

Communicable Diseases Associated with Natural Disasters

The following types of communicable diseases have been associated with populations displaced by natural disasters. These diseases should be considered when post disaster risk assessments are performed.

Water-related Communicable Diseases

Access to safe water can be jeopardized by a natural disaster. Diarrheal disease outbreaks can occur after drinking water has been contaminated and have been reported after flooding and related displacement. An outbreak of diarrheal disease after flooding in Bangladesh in 2004 involved more than17,000 cases. More than 16,000 cases of cholera epidemic in West Bengal in 1998 was attributed to preceding floods, and floods in Mozambique in January–March 2000 led to an increase in the incidence of diarrhoea. In a large study undertaken in Indonesia in 1992–1993, flooding was identified as a significant risk factor for diarrheal illnesses caused by ***Salmonella enterica*** serotype Paratyphi A (paratyphoid fever).

The risk for diarrheal disease outbreaks following natural disasters is higher in developing countries than in industrialized countries. In Aceh Province, Indonesia, a rapid health assessment in the town of Calang 2 weeks after the December 2004 tsunami found that 100% of the survivors drank from unprotected wells, and that 85% of residents reported diarrhoea in the previous 2 weeks. In Muzaffarabad, Pakistan, an outbreak of acute watery diarrhoea occurred in an unplanned, poorly equipped camp of 1,800 persons after the 2005 earthquake. The outbreak involved more than 750 cases, mostly in adults and was controlled after adequate water and sanitation facilities were provided. In the United States, diarrheal illness was noted after Hurricanes Allison and Katrina.

Hepatitis A and E are also transmitted by the faecal-oral route, in association with lack of access to safe water and sanitation. Hepatitis A is endemic in most developing countries and most children are exposed and develop immunity at an early age. As a result, the risk for large outbreaks is usually low in these settings. In Hepatitis E–endemic areas, outbreaks frequently follow heavy rains and floods. The illness is generally mild and self-limited but for pregnant women case-fatality rates can reach 25%. After the 2005 earthquake in Pakistan, sporadic Hepatitis E cases and clusters were common in areas with poor access to safe water. Over 1,200 cases of acute jaundice, many confirmed as hepatitis E, occurred among the displaced. Clusters of both Hepatitis A and Hepatitis E were noted in Aceh after the December 2004 tsunami.

Leptospirosis is an epidemic-prone zoonotic bacterial disease that can be transmitted by direct contact with contaminated water. Rodents shed large amounts of leptospores in their urine and transmission occurs through contact of the skin and mucous membranes with water, damp soil or vegetation (such as sugar cane) or mud contaminated with rodent urine. Flooding facilitates spread of the organism because of the proliferation of rodents and the proximity of rodents to humans on shared high ground. Outbreaks of leptospirosis occurred in Taiwan, Republic of China, associated with Typhoon Nali in 2001. In Mumbai, India, after flooding in 2000, in Argentina after flooding in 1998 and in the Krasnodar region of the Russian Federation in 1997. After a flooding-related outbreak of leptospirosis in Brazil in 1996, spatial analysis indicated that incidence rates of leptospirosis doubled inside the flood-prone areas of Rio de Janeiro.

Diseases Associated with Crowding

Crowding is common in populations displaced by natural disasters and can facilitate the transmission of communicable diseases. Measles and the risk for transmission after a natural disaster are dependent on baseline immunization coverage among the affected population and in particular among children more than15 years of age. Crowded living conditions facilitate measles transmission and necessitate even higher immunization coverage levels to prevent outbreaks. A measles outbreak in the Philippines in 1991 among persons displaced by the eruption of Mt. Pinatubo involved more than18,000 cases. After the tsunami in Aceh in December 2004, a cluster of measles involving 35 cases occurred in Aceh Utara district and continuing sporadic cases and clusters were common despite mass vaccination campaigns. In Pakistan, after the 2005 South Asia earthquake, sporadic cases and clusters of measles (more than 400 clinical cases in the 6 months after the earthquake) also occurred.

Neisseria meningitidis meningitis is transmitted from person to person, particularly in situations of crowding. Cases and deaths from meningitis among those displaced in Aceh and Pakistan have been recorded. Prompt response with antimicrobial prophylaxis, as occurred in Aceh and Pakistan can interrupt transmission. Large outbreaks have not been recently reported in disaster-affected populations but are well-documented in populations displaced by conflict.

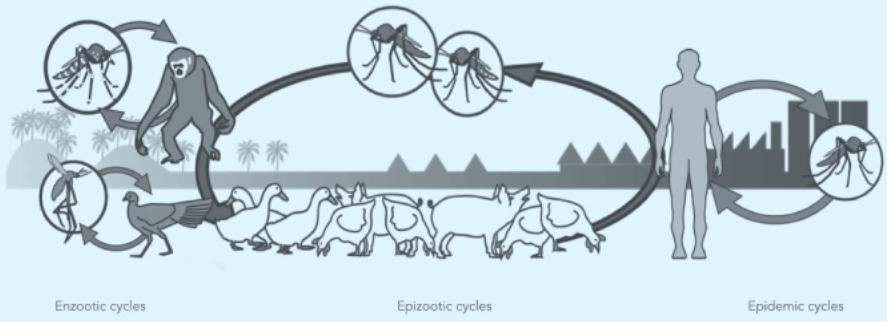
Acute respiratory infections (ARI) are a major cause of illness and death among displaced populations, particularly in children less than5 years of age. Lack of access to health services and to antimicrobial agents for treatment further increases the risk for death from ARI. Risk factors among displaced persons include crowding, exposure to indoor cooking using open flame and poor nutrition. The reported incidence of ARI increased 4-fold in Nicaragua in the 30 days after Hurricane Mitch in 1998 and ARI accounted for the highest number of cases and deaths among those displaced by the tsunami in Aceh in 2004 and by the 2005 earthquake in Pakistan.

Vectorborne Diseases

Natural disasters, particularly meteorologic events such as cyclones, hurricanes and flooding, can affect vector-breeding sites and vectorborne disease transmission. While initial flooding may wash away existing mosquito-breeding sites, standing water caused by heavy rainfall or overflow of rivers can create new breeding sites. This situation can result (with typically some weeks' delay) in an increase of the vector population and potential for disease transmission, depending on the local mosquito vector species and its preferred habitat. The crowding of infected and susceptible hosts, a weakened public health infrastructure and interruptions of ongoing control programs are all risk factors for vectorborne disease transmission.

Malaria outbreaks in the wake of flooding are a well-known phenomenon. Dengue transmission is influenced by meteorologic conditions, including rainfall and humidity and often exhibits strong seasonality. However, transmission is not directly associated with flooding. Such events may coincide with periods of high risk for transmission and may be exacerbated by increased availability of the vector's breeding sites (mostly artificial containers) caused by disruption of basic water supply and solid waste disposal services. The risk for outbreaks can be influenced by other complicating factors, such as changes in human behaviour (increased exposure to mosquitoes while sleeping outside, movement from dengue-nonendemic to endemic areas, a pause in disease control activities, overcrowding) or changes in the habitat that promote mosquito breeding (landslide, deforestation, river damming and rerouting of water).

Vector-borne disease transmission cycles.



Note: vector-borne diseases occur in a staggering number of environments and include an incredible diversity of pathogens, hosts, and vectors. However, these diseases can generally be described within three broad categories of environments and transmission cycles: natural (e.g. forests), modified (e.g. rural, agricultural), and human (urban). This schematic is not intended as representative of a particular disease but as a general model that is adaptable according to the pathogen, vector(s), host(s), and environment(s) in which they occur.

Source: *The ecological dimensions of vector-borne disease research and control* (Available at http://www.scielo.br/scielo.php?pid=S0102-311X2009001300015&script=sci_arttext)

Other Diseases Associated with Natural Disasters

Tetanus is not transmitted person to person but is caused by a toxin released by the anaerobic tetanus bacillus ***Clostridium tetani.*** Contaminated wounds, particularly in populations where vaccination coverage levels are low, are associated with illness and death from tetanus. A cluster of 106 cases of tetanus, including 20 deaths, occurred in Aceh and peaked 2½ weeks after the tsunami.

An unusual outbreak of coccidiomycosis occurred after the January 1994 Southern California earthquake. The infection is not transmitted person to person and is caused by the fungus ***Coccidioides immitis***, which is found in soil in certain semiarid areas of North and South America. This outbreak was associated with exposure to increased levels of airborne dust subsequent to landslides in the aftermath of the earthquake.

Source: Adapted from *Epidemics after Natural Disasters* (Available at http://www.cdc.gov/ncidod/eid/13/1/1.htm)

Risk Factors for Communicable Disease Transmission

Responding effectively to the needs of the disaster-affected population requires an accurate communicable disease risk assessment. The efficient use of humanitarian funds depends on implementing priority interventions on the basis of this risk assessment.

A systematic and comprehensive evaluation should identify:

1. Endemic and epidemic diseases those are common in the affected area.
2. Living conditions of the affected population, including number, size, location and density of settlements.
3. Availability of safe water and adequate sanitation facilities.
4. Underlying nutritional status and immunization coverage among the population.
5. Degree of access to healthcare and to effective case management.

Protect Mental Health

- The days and weeks after an emergency are going to be rough. Some sleeplessness, anxiety, anger, hyperactivity, mild depression or lethargy are normal and may go away with time. If you feel any of these symptoms acutely, seek counselling.
- Seek medical care if you are injured, feel sick or have acute stress and anxiety.
- Keep as many elements of your normal routine incorporated into the disaster plans as possible, including activities to calm children's fears.
- Be aware that you may have fewer resources to attend to your day-to-day conflicts, so it is best to resolve what you can ahead of time.
- Turn to family, friends, and important social or religious contacts to set up support networks to deal with the potential stressors.
- Let your child know that it is okay to feel upset when something bad or scary happens. Encourage your child to express feelings and thoughts, without making judgements.

Prevent Illness from Sewage

- If there is flooding along with a hurricane, the waters may contain faecal material from overflowing sewage systems and agricultural and industrial waste. Although skin contact with floodwater does not, by itself, pose a serious health risk, there is risk of disease from eating or drinking anything contaminated with floodwater.
- If there has been a backflow of sewage into your house, wear rubber boots and waterproof gloves during cleanup.
- If you have any open cuts or sores that will be exposed to floodwater, keep them as clean as possible by washing them with soap and applying an antibiotic ointment to discourage infection.
- Wash clothes contaminated with flood or sewage water in hot water and detergent and separately from uncontaminated clothes and linens.
- Do not allow children to play in floodwater areas and do not allow children to play with floodwater-contaminated toys that have not been disinfected. Disinfect toys by using a solution of one cup of bleach in five gallons of water.

Avoid Mosquitoes

- Rain and flooding in a hurricane area may lead to an increase in mosquitoes, which can carry diseases like West Nile Virus and Dengue. In most cases, the mosquitoes will be pests but will not carry communicable diseases.

- To protect you from mosquitoes, use screens on dwellings and wear long pants, socks and long-sleeved shirts and use insect repellents that contain DEET or Picaridin. Care must be taken when using DEET on small children. More information about these and other recommended repellents can be found in the fact sheet “Updated Information Regarding Insect Repellents”.
- To control mosquito populations, drain all standing water left in open containers, such as flower pots, tires, pet dishes or buckets outside your home.

Prevent or Treat Wounds

- Immediately clean out all open wounds and cuts with soap and clean water. Keep wounds covered with clean, dry bandages that are large enough to cover the wound and contain any pus or drainage. Change bandages as needed and when drainage can be seen through the bandage. Contact a doctor to find out whether more treatment is needed (such as tetanus shot). If a wound gets red, swells or drains, seek immediate medical attention.
- Avoid wild or stray animals. If you are bitten by any animal, seek immediate medical attention. If you are bitten by a snake, try to identify it, so that if it is poisonous, you can be given the correct anti-venom. Do not cut the wound or attempt to suck the venom out.

- If your skin or eyes may have come in contact with hazardous materials, such as acid from a car battery, wash thoroughly with decontaminated water and seek medical attention as needed.
- If you have wounds, you should be evaluated for a tetanus immunization, just as you would at any other time of injury. If you receive a puncture wound or a wound contaminated with feces, soil or saliva, have a doctor or health department determine whether a tetanus booster is necessary based on individual records.

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Handling of Human Remains from Natural Disasters

Victims of natural disasters usually die from trauma as a direct result of the type of disaster and are unlikely to have acute or “epidemic-causing” infections. The reason human remains pose such a limited health threat is that after death the body temperature can rapidly drop, resulting in the corresponding death of most bacteria and viruses. This makes it extremely difficult for microorganisms to transfer from dead bodies to vectors and from vectors to human populations, such that the risk that dead bodies pose for the public is usually small. However, persons who are involved in close contact with the deceased, such as military personnel, rescue workers, volunteers and others, may be exposed to chronic infectious hazards, including Hepatitis B virus, Hepatitis C virus, Human Immunodeficiency Virus (HIV), enteric pathogens and Mycobacterium Tuberculosis. Appropriate precautions for these persons include training, use of body bags and disposable gloves, good hygiene practice and vaccinations for Hepatitis B and Tuberculosis.

HAZARDS ASSOCIATED WITH HUMAN REMAINS

Direct Contact

Personnel such as pathologists, mortuary staff and body retrieval teams handling human remains have a potential risk of exposure to Hepatitis B virus (HBV) and HIV. For all others, blood and body fluid exposures are minimal and the risk of contracting HBV is very low. The risk of contracting Hepatitis C virus or HIV approaches zero. Transmission is relatively inefficient for these diseases, requiring percutaneous exposure (from a needle stick or exposure from a sharp penetrating object), direct contact with mucous membranes (such as eyes, nose, or mouth) or direct contact with non-intact skin (abraded, chapped, inflamed, or with visible wounds or traumas). Exposures on intact skin are not a risk for these blood-borne infections.

Because a corpse will commonly leak faeces, persons handling the deceased are more likely to be exposed to gastrointestinal organisms than to blood borne viruses. Workers may be exposed through direct contact with the victim’s body and soiled clothes and transmission can occur via the faecal-oral route. Contamination of other equipment, such as stretchers and vehicles used for transportation or storage, is also possible. However, common gastrointestinal organisms do not survive long in the environment and present little risk of infection where the body has been decaying for some time or has been in the water.

Water Supply Contamination

Human remains in contact with local potable water systems have rarely been associated with transmission of bacterial or viral gastrointestinal diseases. Water supplies in affected regions are much more likely to be contaminated due to extensive damage to sanitation systems.

Insect-borne Diseases

Filth flies (including the house fly, blow fly, little house fly and false stable fly) feeding on contaminated material such as faeces and rotting corpses can mechanically transfer contaminated material directly to humans and human food supplies. An increased density of filth flies, serving as mechanical vectors, could increase the risk of acquiring bacterial diarrheal such as shigellosis.

Common mosquito-borne diseases in humans such as malaria and dengue fever are not efficiently spread from dead bodies. Additionally, mosquito vectors are attracted to the carbon dioxide produced by living humans therefore corpses would not attract these vectors.

Types of Natural Disasters

Natural disasters come in many shapes and sizes. In order to be prepared you have to know about different types of disasters. Most are related to the weather but some are geological.

Natural disasters can arise from:

- Weather patterns e.g. storms, cyclones, hurricanes, floods, tornadoes;
- Other climatic conditions e.g. droughts, bush fires, avalanches;
- Changes in the earths' crust e.g. volcanoes, earthquakes, tsunami or tidal waves.

Earthquakes

An Earthquake is a sudden shake of the Earth's crust. The vibrations may vary in magnitude. The earthquake has point of origin underground called the "focus". The point directly above the focus on the surface is called the "epicentre". Earthquakes by themselves rarely kill people or wildlife. It is usually the secondary events that they trigger, such as building collapse, fires, tsunamis (seismic sea waves) and volcanoes, that are actually the human disaster. As many of these could be avoided by better construction, safety systems, early warning, and evacuation planning, the term unnatural disaster is not unwarranted.

Volcanic eruptions

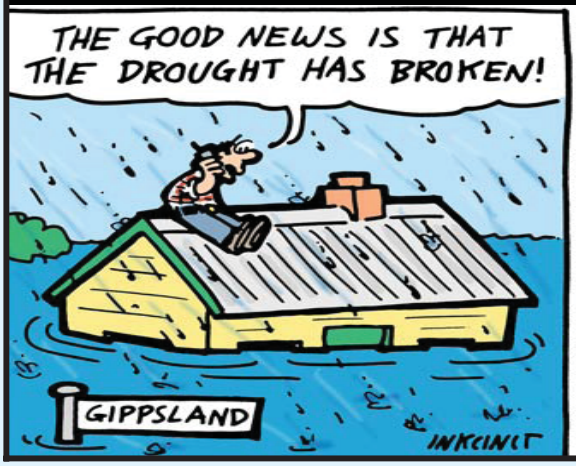
An Eruption may in itself be a disaster due to the explosion of the volcano or the fall of rock but there are several effects that may happen after an eruption that are also hazardous to human life. Lava may be produced during the eruption of a volcano a material consisting of superheated rock. There are several different forms which may be either crumbly or gluey.

Tsunamis

Tsunamis can be caused by undersea earthquakes as the one caused in Ao Nang, Thailand by the 2004 Indian Ocean Earthquake, or by landslides such as the one which occurred at Lituya Bay, Alaska in 1958.

Tornadoes

Some of the most violent tornadoes develop from supercell thunderstorms. A supercell thunderstorm is a long-lived thunderstorm possessing within its structure a continuously rotating updraft of air. These storms have the greatest tendency to produce tornadoes, some of the huge wedge shape. The supercell thunderstorm has a low-hanging, rotating layer of cloud known as a "wall cloud." It looks somewhat like a layer of a layer cake that hangs below the broader cloud base. One side of the wall cloud is often rain-free, while the other is neighbored by dense shafts of rain. The rotating updraft of the supercell is seen on radar as a "mesocyclone." The tornadoes that accompany supercell thunderstorms are more likely to remain in contact with the ground for long periods of time -- an hour or more -- than other tornadoes, and are more likely to be violent, with winds exceeding 200 mph.



Earthquake : A damaged building is seen in Padang, Indonesia.

Typhoon Parma : Houses underwater as they are seen in this aerial picture in Angono town in eastern Manila, Philippines.

Tsunami : A damaged truck is seen among wreckage after a tsunami hit the village of Leone, American Samoa.

Flood : Villagers wading through the flood waters in India.