

Spread of Communicable Diseases in Post Disaster Scenario

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Abstract

In post disasters scenario communicable diseases results in challenges in the form of deaths and burden of disease on system. This study investigated the association of natural disasters with communicable diseases in internally displaced people and their health outcomes. The purpose and objective of this paper is to identify and quantify the risk of spread of communicable diseases in post disaster scenario, identify innovative opportunities to deal with these issue with the aim of improving public health and encouraging sustainable development process in Pakistan by highlighting the key protective measures and risk factors of communicable diseases and its burden, which will help in managing this problem through multi-disciplinary, incorporated, and multi-sectoral approaches. There are certain risk factors which promote and enhance the spread and transmission of communicable diseases like acute watery diarrhea, measles, malaria, polio and acute respiratory infection. This burden in the form of mortality and morbidity preventable as successful interventions are available. Effective disease surveillance, adequate and clean water supply, properly planned and ventilated shelter, sufficient food, proper hygiene and sanitation along with immunization, awareness and health education is critical. Delivery of the services is often compromised by damage to infrastructure, poor coordination and central command system, insecurity, religious extremism, and loss of health staff. Existing intervention must be implemented in more coordinated and systematic way in post disaster settings, preparedness plans must include Sphere standards to effectively prepare for outbreaks. Further research is necessary to identify effective interventions.

Keywords

Disasters, Environment, Communicable Diseases, Surveillance

Received: March 5, 2015 / Accepted: March 20, 2015 / Published online: March 24, 2015

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1. Introduction

Disasters of are events which overwhelm the existing resources causing large scales catastrophes. Disasters take place when any hazard comes in contact with or impact on exposed and vulnerable group of people. So the combination of existing state of vulnerability and hazards with lack of capacity to decrease the possible harmful effects of risk leads to disaster. According to United Nations International Strategy for Disaster Reduction (UNISDR), a disaster is “a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected

community or society to cope using its own resources”. The origins of these disasters can be hydrologic, geophysical and atmospheric. Extreme climatic and weather events resulted from global climate change lead to large scale losses and consequences.

However countries mostly affected by these climatic changes are the developing nations of Asia and Africa. Khan argued that certain countries of Asia and Africa are mainly affected because of uneven population dynamics, poor growth, extensive poverty, larger reliance on climate-sensitive ecology, lack of economic and institutional capacities and underprivileged governance (Khan et al. 2011). In last two decades, disasters of natural origin have killed millions of

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people worldwide, and it also badly affected one billion lives. These disasters resulted in extensive financial damage. Underdeveloped countries with lack of resources, lack of infrastructure and with poor disasters preparedness plans are unduly affected.

The natural disasters frequently experienced in Pakistan in particular and World in general are floods, earthquakes, landslides, volcanic eruptions, cyclones, tsunamis, GLOF, and droughts. . The Global economic cost related to these hazards is also on rise (Masozera et al., 2007). These disasters are frequently resulting in serious health outcomes, economic and social problems. According to world disaster report of 2003, in Pakistan natural disasters led to deaths of 6037 people and 8989631 people were affected in result of these catastrophic events (World Disasters Report 2003, Geneva).

Major disasters resulted in displacement of large number of population. John believed that these large scale displacements give rise to risk of outbreaks. The underlying risk factors are unavailability of clean drinking water and overcrowding, poor sanitation, primary health issues of the residents, and available services of healthcare, (John T. Watson et. al. 2007).

Disasters can contribute in spread and transmission of communicable diseases, overwhelm health care system, particularly when water supply, hygiene and sanitation systems is disrupted, and it mainly happens because of overcrowding and displacement and normal health care services are also interrupted. (Marianne E. Zotti et al. 2013). This is also affirmed in 2006 by Sztajnkrzyer. He stated that routine medical services are always insufficient and inadequate in disasters settings (Sztajnkrzyer MD., 2006).

The mode of transmission of communicable diseases is from one individual to another and it can also be transmitted from animals to human being. The spread usually takes place through water born, airborne bacteria and viruses; it can also be transmitted via body fluids and blood.

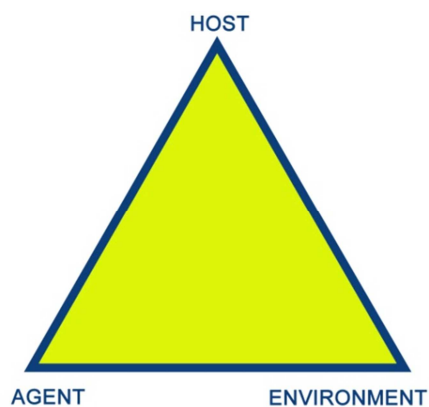


Figure 1.0. Communicable disease model

If we look at the model of communicable disease, it comprises of three elements; infectious agent, host and environment. These three elements remain the minimum requirements and reasons for the spread, transmission and presence of a communicable disease in a place and population. The infectious agent is a causative agent, an element that should be there to initiate infection and spread it. Viruses, Bacteria, and parasites are some the examples of causative agents. Then the host, which can be any vulnerable organism, human being, plants, or animals which can be attacked by causative infectious agent and it can become host. This process requires a supportive environment, which includes all other aspect that either promotes or prohibits disease transmission. For example flood or stagnant water gives rise to water born diseases like cholera, malaria, and dengue. So communicable disease originates and transmits when a vulnerable host and causative infectious agent remains in an environment that permit disease spread.

To break the chain one component must be removed or controlled for the prevention of disease and protect it from further damages in the form of outbreaks and mass transmission.

2. Methods

The method of research used for the study is Meta-Analysis. It is an effective way of conducting purposeful research on a specific topic by reviewing different studies and published articles. To assess Pakistan outcomes of disaster on maternal health, a systemic literature survey of the different research articles, reports, and documents published during the period of 1988 and December 2013.

The search of literature mainly focused on post disaster settings, communicable diseases, outbreaks and burden of disease due to communicable diseases in Pakistani context as well as global prospective and the language used for the search was limited to English only. The search vocabulary included communicable diseases and air-borne and water-borne diseases, victor borne diseases, epidemics, endemics and pandemics, malnutrition, mortality and morbidity, and disaster vocabulary included natural and human induced disasters in Pakistan i.e. floods, earthquakes, landslide, civil war, internal displacement, camps and temporary housing.

Different international databases were used for the search: Springer, Disaster Prevention and Management (Emerald), Medline, Science Direct, PubMed, databases World health organization, Center for disease control and prevention (CDC), International Federation of Red Cross (IFRC) and UNISDR. The reference lists of different relevant articles and journals were also reviewed that fulfilled inclusion criteria to discover supplementary citations of significance.

Unpublished papers, articles, presentations, dissertations and documents were avoided and not included. Summaries gathered from searched materials were screened to meet the requirements for inclusion, and have link with purpose of the study in Pakistani context.

3. Discussion

Natural disasters like earthquakes, and floods which are more common in Pakistan results in damage and destruction leads to massive displacement of population. These disasters also damages infrastructure, lifelines, health care structures, health clinics, roads and other means of communication which further hampers access to basic health care services which adversely impacts on all segments of health-care delivery system. This destruction further hampers capacity of the surveillance system which early detects and responds to outbreaks.

3.1. Risk Factors

There are so many factors which promote the spread and transmission of communicable diseases in post disaster scenario. One of the leading and most frequently occurring factors is mass movement of the population and settlement in temporary locations, camps often leading overcrowding, poor hygiene and sanitation, poor waste management, or absence of shelter, disasters resulting in environmental degradation, economic losses, poverty, insufficiency of safe and clean water, poor nutritional status of internally displaced population resulted from shortage of food, and no access to health care. Health care system is always under pressure to address routine and daily operations while disasters overwhelm them and make them collapse leading to chaos. Hospitals and health care setups are already under pressure to care for patients who present during usual operations each day. Health care and emergency health care systems are already facing stress and massive challenges. This collapse and overwhelming of healthcare systems and absence of basic health care services give rise to secondary problem like communicable diseases such as malaria, hepatitis, polio, measles and pertussis. There are some secondary factors in the form of unstable governance, current and ongoing conflict and insecurity and law and order situations, secondary hazards, poor coordination system among stakeholders' donors and poor command system.

3.2. Communicable Diseases

3.2.1. Diseases Associated with dense population

Displacement of population followed by disaster always results in overcrowded conditions in planned camps, which

give rise to the risk of transmission of some communicable diseases. Diseases like acute respiratory infections, tuberculosis, meningococcal infections are mainly transferable from individual to individual via sneezing, coughing and respiratory droplets. The risk of these diseases is more in overcrowded camps.

Morbidity, mortality and diseases burden related to acute respiratory infections is also very high in post disaster settings. The underlying risk factors of acute respiratory infections are overcrowded conditions resulted from displacement, indoor fires in camps and scattered settlements, and inadequacy in the provision of non-food items like blankets warm clothes and shelter, particularly in colder weather, resulting in positive situation for respiratory droplet infection transmission. Acute respiratory infections similarly increase the spread risk for meningococcal sickness via aerosol spread of respiratory discharge during sneezing and coughing. In 1993, 30% of the under-5 deaths in residents of Kabul, Afghanistan and 23% of those in displaced people were a result of acute respiratory infections.

3.2.2. Vaccine Preventable Diseases

There are certain diseases which can be prevented and eradicated through organized and multi-sectoral approach, campaigns, awareness and vaccination. These vaccine preventable communicable diseases are Polio, Measles, diphtheria, pertussis, and tetanus.

(i) Polio

Pakistan is among the three countries where polio is still an endemic infection. The situation in Pakistan regarding polio virus were complex but becoming worse day by day. Up till now the lowest reported number of cases in a year is 32 which were in 2007. In year 2011 In Pakistan reported cases were 198 and it remained the world's highest number of polio cases in 2011, and these figures were reported following the mega floods of 2010 and 2011. The focal point or center of the remaining cases of polio is considered to be Karachi city Baluchistan Province, and Federally Administered Tribal Areas (FATA). Almost 25% of children in Karachi are unvaccinated against polio; in Baluchistan province about 50% children remained unvaccinated every time.

There are many factors which are preventing the successful eradication process of polio. Frequent and catastrophic natural disasters along with Verbal myths about polio vaccine, and the recent fake polio campaign in the city of Abbottabad for a political reasons, so called religious extremism of some fundamentalist leading to the killing of polio workers and their security workers, and to some extent Pakistan repeatedly re-infect by the proliferation of refugees across the border from Afghanistan which is also amongst

the highly unvaccinated countries.

(ii) Measles

According to Toole measles epidemics are the major causes of deaths in IDP camp. He estimated that measles resulted in 53% in camps of eastern Sudan in 1985 and 42% of deaths in refugees' camps in Somalia in the same year of 1985. (Toole MJ, Waldman RJ 1988)

However spread of such epidemics, frequency and damage from measles reduced in 1990 as compared with 1980s. Toole believed that the reduction in the trend of measles epidemics and losses is due to raised awareness regarding mass campaign of vaccination by international organization and implementation of expanded program of immunization in post disaster scenario and planned camps. (Toole MJ, Waldman RJ 1993).

Aaby argued that Overcrowding is linked with the spread of a higher contagious level of measles virus resulting in very severe clinical type of disease (Aaby P, 1988). The incidence of atrocious measles is also raised in children who are malnourished. Along with its relation with malnutrition measles also decreases the amount of vitamin A in the body resulting in eye problems and even blindness. In settings with poor diet, vitamin A might already be present in post disaster settings.

3.2.3. Vector-Borne Diseases

(i) Malaria

Malaria result in 1 million deaths worldwide annually in which 90% of them take place in sub-Saharan Africa and about 30% of malaria related mortality takes place in countries with disasters in Africa. People displaced and migrated from low endemic zone to high endemic zone are extensively exposed to high level of malaria, same like people moving from higher endemic zone to lower endemic zone are exposing the environment and local communities to the to the epidemic of malaria specially if there are favorable conditions in the form flood stagnant water, higher rain ratio and climatic changes. Overcrowding conditions and temporary shelters and camps provides favorable condition in the form of higher bite frequency and increase transmission ratio, insufficient access to health care services, which thwart early detection of symptoms, proper diagnosis, and proper treatment.

(ii) Dengue

Spread and transmission of dengue is raised following monsoon rains, hot humid conditions. Pakistan experienced back to back outbreaks of dengue in 2012 and 2013 in Lahore and Khyber Pukhtunkhwa respectively. Monsoon

rains leads to stay of water which are sources of vector breeding sites.

3.2.4. Water-Borne Diseases

Those diseases which can be transmitted through the contamination of water and this water contamination also lead to contamination of food as well. Water-borne diseases accounts for most of the outbreaks in the post disaster situation.

(i) Skin Diseases

In Pakistan in floods 2010 the most frequently reported communicable diseases were skin diseases which were 19% of all. Incidence ratio of scabies in camps was very high as it is very contagious and can spread from one individual to another. Unhygienic and overcrowded conditions, poor sanitation and unavailability of clean water are the root causes of skin diseases.

(ii) Diarrheal Diseases

Diarrheal diseases results in major consequences in post disaster settings. The underlying causes of these diseases are unavailability of clean water inadequate and poor sanitation facilities, unhygienic conditions, overcrowding, and shortage of soap. In camps, diarrheal diseases results in higher mortality especially in the initial phases an emergency, targeting the vulnerable group of children less than 2 years. Previous investigations of some outbreaks revealed that frequent sources of infectivity are contaminated water by faeces which is widely used in camps, polluted water during storage and transport and unhygienic foods.

According Máire in 1994 in north Kivu, Democratic Republic of the Congo, 1 million refugees were settled in camps, reported 50000 deaths , 85% of the of deaths were resulted from diarrheal diseases, in which cholera accounted for more than 60% and dysentery accounted for 40% of deaths (Máire A Connolly et. al. 2004)

In Pakistan floods 2010, about 18 million people were affected. According World Health Organization surveillance report most frequently reported conditions were skin problems, respiratory problems, and diarrheal diseases. Total 130 outbreaks were reported, in which diarrheal diseases accounted for 115 (88.5%) outbreaks mainly suspected cholera ((MMWR, CDC 2012).

(iii) Hepatitis A and E

According to Chin viruses of Hepatitis E and A can be transmitted mainly through the route of faecal-oral (Chin, 2000). The main reason behind the outbreaks and spread of Hepatitis E virus is contamination of water and the reason behind the outbreaks of Hepatitis A virus is contamination of

water and food both. According to a recent review by Piper which suggest that most of the great spreads and outbreaks of Hepatitis E Virus are resulted following heavy floods and monsoon rains (Piper-Jenks *et al.*, 2000). McCarthy also reported outbreaks of Hepatitis A and Hepatitis E viruses after the floods in Sudan in 1994 (McCarthy *et al.*, 1994).

3.3. Burden of Disease and Vulnerable Groups

Any discussion on health issues should be accompanied by the scale that can be used to measure the health problems. Mostly health problems are measured in terms of mortality, but this single indicator is not sufficient for description of losses other than death for example injuries, physical disabilities and loss of productivity due to pain or other disability.

The burden of disease refers to magnitude and nature of a disease on a population along with its risk factors. Traditionally, burden of diseases has been calculated in terms of individual affected or morbidity and in terms of lives lost or mortality and associated disabilities. In different areas and regions diverse measurement tools of assessment for disease burden and health status is used. Rareness in appropriateness, adequacy and accuracy of statistical data due to diverse measurement tools have frequently led to either under-estimations or in some cases over-estimations, and led to substantial complicatedness in implementation of global evaluation of health outcomes, needs and burden of disease. It is also effecting the implementation and planning of cost efficient and cost effective interventional procedures for the promotion of health and control and prevention of disease.

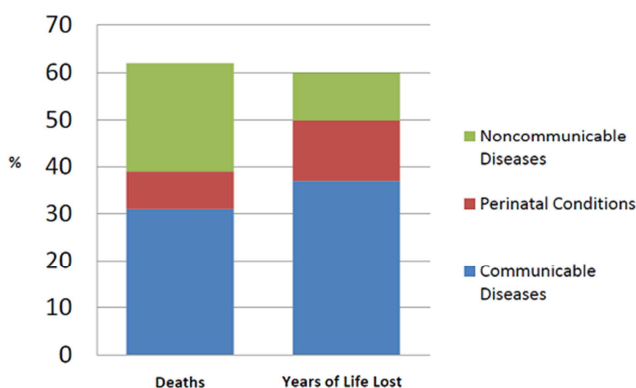


Figure 2.0. Percentile outbreak of diseases in post-disaster scenario

Savioli argued that Communicable diseases in post disaster phase results in an elevated economical burden, affecting individuals, families, communities, countries and even the regions disrupting its development. Savioli gives the example of Kenya in late 1970s, when US\$4.4 million were lost on citizens contaminated with *Ascaris lumbricoides*, causing lack of absorption of food annually, and this cost can even

rise with the growth in population if certain definite control and prevention measures were not taken. (Savioli L, Stansfield S, *et. al.* 2002).

The urgent need of an identification of a single, widely accepted, and appropriate yard stick for the measurement of disease burden was fulfilled by World Health Organization by initiating large scale BOD programs and developed an index named DALY which is “disability adjusted life years”. The DALY measures life years lost due to premature deaths and number of years lived with disability of particular duration and severity. Murray stated that one DALY means that if some losses one year of healthy life due to some disability caused by a disease (Murray and Lopez 1996). Still the index of DALY and its measurement technique have certain limitations since it involves pre decided values for decision making labeled to health and human life of diverse ages. There are some ethical issues in this measurement tools which are widely criticized globally i.e. it is believed that DALY assumes that the quality of lives of disabled people are less valued as compared with those of no disabilities and these statement are in contrast with WHO basic principles. So the current considerations should be addressed as amendments in the DALY protocol.

3.4. Surveillance & Disease Early Warning System

Surveillance can be defined as “continuous methodical compilation, analysis, and interpretation of health related data, which is necessary for planning, implementation, and evaluation of certain public health interventions. It also comprises of appropriate distribution and dissemination of data with stakeholders and those who should be informed. The final and most important step in surveillance process is the use of this processed data for disease control and prevention”.

For successful control of outbreaks of communicable diseases during disasters an efficient surveillance is very critical. Attempts to provide clean water, provision of food and non food items, maintaining hygiene and sanitation is good practices but still not enough to achieve results. Collection and analysis of regarding health outcomes will guide us to early detection of outbreaks and will help us to promote and enhance disease early warning system, and will help us to identify vulnerable groups to communicable diseases.

Good surveillance will help us in increased understanding of dynamic disease patterns and will guide us to identify measures for disease control. During natural and human induced disasters, early initiation of a surveillance system is a key. The sooner the surveillance system is set up the more effective it will. To make the surveillance system more effective it should be linked with enhanced disease early

warning system (DEWS) to detect outbreaks and inform responses.

Disease early warning system and surveillance system must focus on type of diseases that are more problematic and can be restricted through local measures. The facility-based surveillance system must be supported through community based intervention like community based surveillance that involves different healthcare workers, volunteers and informants to collect data via door to door visits which is very essential for identifying ground realities.

3.5. Emergency Preparedness

Along with underlying risk factors there are many other factors which can contribute in failure to prevent diseases and outbreaks. Lack of funds, lack of political dedication, ineffective surveillance systems, poor or no participation of the community, lack of resources, lack of technical competencies and trained staff at community level are some factors which can contribute in poor outcomes.

According to the Sphere Standards there are certain measures and protocols that should be taken to guarantee preparation for any disease outbreaks.

1. A plan of control and investigation for an outbreak should be prepared.
2. It should be made sure that control and investigation protocols for common outbreaks are accessible by related personnel.
3. It should be made sure that medical goods, stocks of important drugs, basic protective devices and materials and vaccines are available at the time of emergency in the form of reserved stock.
4. Different resources of significant outbreaks vaccines are clearly mentioned and identified and available for quick supply and use. Instruments and protocols of quick supply must be known.
5. Pre planned location for the separation; quarantine and medical treatment of infected cases are established like diarrhea treatment centers.
6. A national diagnosing and confirmation lab should be established that can confirm declaration of an epidemic and diagnoses of cases like National Institute of Health laboratories in Islamabad.

4. Conclusion & Recommendation

Good preparation in terms of sustainable and clean environment for disasters can help us in mitigating the effects.

Stability of functional and operational planning, preparation and testing of emergency management plans, and community based preparedness plans can improve public health outcomes in post disaster settings.

Reestablishment of basic infrastructure, lifelines, incorporation of livelihood in planned camps according to sphere standards, availability of clean drinking water and enough storage of water for the purpose of washing, alternates for the storage of food, and maintaining hygienic conditions will improve and promote health outcomes and prevent the spread of communicable diseases.

Access to basic healthcare services, testing of supplied and available water in camps is needed. Continuing public health activities, social marketing, raising awareness, training of staff, proper vaccination, disease and vector control are some basic but important activities that will promote health outcomes.

Surveillance of communicable diseases before disasters and during disaster is very important to prevent risk of major outbreaks, identify patterns of certain diseases and promote disease control measures. This surveillance can be improved if it is linked with community based surveillance system and disease early warning system.

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