

Review Article

Impacts of Disasters on Public Health within the Context of Pakistan

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***Corresponding author:** Naeem Shahzad, National University of Science and Technology, Pakistan**Received:** November 25, 2021; **Accepted:** December 16, 2021; **Published:** December 23, 2021**Abstract**

Every year, a large number of populations are affected by manmade or natural disasters, resulting in injuries, acute illness and epidemic outbreaks adversely affecting public health at the individual, community and societal levels. However, the spread of communicable diseases after disaster events is strongly linked with the displacement of people and the availability of basic human needs, including the provision of adequate water, sanitation and food supply. However, most of the health impacts after disasters, especially within displaced populations, are due to a lack of availability of safe water and sanitation and overcrowding in camps. Another important contributing aspect of communicable outbreaks is the availability of health care services during disasters, which may have been destroyed, consequentially resulting in disruption and incapacitation. This may further deteriorate the health of the affected population. Furthermore, the impacts of the current COVID-19 pandemic transformed into a volatile situation, revealing the fragile health sector globally. In developed countries, the health care delivery system was overburdened and faced difficulties coping with this catastrophe, while in developing countries, the neglected and underfunded health care system aggravated the calamity, leading to mayhem. Although government and nongovernment organizations tried their level best to control the situation, due to scarcity of resources and huge population affected, it was very difficult for them to respond to these unprecedented circumstances. Effectively preparing and responding to current and projected health issues requires ongoing assessment and interventions to promote resilience to public health stressors and the provision of effective health services. This paper discusses the impacts of public health issues in the context of Pakistan based on a review of national and international documents and internal processes.

Keywords: Disasters; COVID-19; HCWs; Communicable diseases; Immunization; Surveillance; IDPs; Public health

Introduction

Disaster refers to an abnormal situation that disrupts the social fabric and functioning of society. It is an emergency situation where saving lives becomes the first priority and demand of the time. Disasters may be natural, such as earthquakes, floods, tsunamis, and landslides, or manmade, such as industrial, oil spills, bomb blasts, terrorism, etc. Asia is the most prone continent to natural disasters, and every year, a large number of people are affected either through manmade or natural disasters. Increasing vulnerability affects worldwide, and the overall estimated losses from these disasters have increased to US\$ 40 billion in 1990, as it was 3.9 billion in 1950 (IPCC 2001). Similarly, Pakistan experienced natural disasters of different types and natures, especially earthquakes in 2005, floods in 2010 and 2011, and terrorism in 2008. Above all, the current pandemic outbreak remained the most fatal outbreak of this century. The current pandemic caused by coronavirus, distinguished by Chinese authorities on January 7th, 2020, is called COVID-19 [1]. The pandemic rapidly started to spread worldwide from county to country [2]. The number of new cases rapidly increased daily (Prompetchara et al. 2020). During the early stage when this pandemic was started in January 2020, initially, there was no vaccine (Ahmad et al. 2020). In addition to vaccines, there is no specific recommended treatment for curing this disease (Sanders

et al. 2020).

These outbreaks highlighted the regional susceptibility to natural and manmade disasters. Furthermore, these disasters resulted in a huge number of IDPs, and they experienced multiple health issues. In addition, floods, earthquakes, and terrorism resulted in thousands of deaths and were much more seriously affected. Millions of people became homeless, economically impacted and many more injured and disabled because of these disasters. In fact, disaster impacts are catastrophic and beyond coping within existing capabilities. The current outbreak proved that our health care delivery system needs a comprehensive approach to cope with such events. On the other hand, the public health sector has badly impacted these events, and there are fewer implications of public health principles to cope with these situations. This paper highlighted the public health consequences due to natural and manmade disasters and the principles that can be implemented to tackle these situations.

The impacts of natural and manmade disasters on public health are categorized as follows:

- Direct affects on public health
- Direct influence on existing health system

- Indirect affects of disaster on public health
- Indirect concern on existing health services

Direct Effects on Public Health

The most serious effect on the public health of the affected population is that of deaths and injuries that can be directly attributed to disasters. In the past twenty years, approximately 3 million lives have claimed due to natural disasters, and 800 million have been negatively affected [3]. However, the COVID-19 death toll was above all these previous catastrophes. Approximately 210 countries were affected by this fatal outbreak, which affected a large population. The outbreak affected approximately 4,088,848 cases and 283,153 deaths [2]. According to the WHO report on February 6, 2021, 104,956,439 confirmed cases, including 2,290,488 deaths, occurred globally due to COVID-19 [2]. The mortality and morbidity due to COVID-19 were controlled to some extent based on the capacity of the health care system and the implementation of SOPs in the countries. In Pakistan, the total number of confirmed cases until 6 February 2021 was 551,842, with 11,886 deaths reported by the WHO [2].

Injuries

Various types and natures of disasters result in different types of disabilities, and this disability produces different levels of mortality and morbidity. However, most flooding and earthquakes are attributed to a large number of deaths and injuries. Earthquakes and high wind events produce a large number of injuries that may require intensive care [3]. An example of deaths and injuries related to earthquakes is the 2005 earthquake in Pakistan Kashmir, which caused a large number of fatalities and injuries. However, the number of severities of injuries and deaths are related to factors associated with earthquakes, such as the magnitude of the earthquake, building construction, and vulnerability of the population and seismic zone. However, the key factors are associated with the magnitude of earthquakes, soil conditions and construction practices (Bourque, 1998). The 2005 earthquake in Pakistan showed that earthquakes have the potential for destruction and death. A magnitude of 7.6 earthquake occurred, which caused thousands of buildings to collapse, and the result was an estimated 75 thousand deaths.

Communicable diseases

The fundamental role of concerned health authorities is to manage the potential risk of infectious diseases after disasters, as the probability of epidemic outbreaks and infectious diseases exists after disasters, although the occurrence of such outbreaks is rare [3]. However, recently, coronavirus catastrophes have become more volatile and have almost affected the health care delivery system globally. The spread of this pandemic outbreak was similar to a wild fire. COVID-19 remained the most fatal pandemic during this century and suffered millions of people worldwide. Although, initially, there was no vaccine but in the countries where influential policies were taken, the preventive measures were very effective there. These measures included people's health education and SOP implementation and follow-up. The pandemic has dramatically affected most countries, and their health care delivery system has reached almost the point of exhaustion. The rising human toll health care system is enduring regionalization in many countries and is severely affected. Most of the vulnerable countries were disproportionately impacted in this fatal

catastrophic situation. Mostly in developed countries, avalanches overburden health care delivery systems. However, in developing countries where the health care delivery system was mostly neglected and remained underfunded, the pandemic remained more volatile. In most countries, the lack of bold steps and fragile health care delivery systems has resulted in unprecedented human catastrophe. The COVID-19 catastrophe began to spread all over Pakistan in February 2020.

Internal displacement

The occurrence of communicable disease and its spread is strongly linked with the characteristics and size of the displaced people, especially the provision of adequate water supply, food, functioning latrine and washing facilities. Moreover, the vaccination status of preventable disease, nutritional status and availability of health services [3]. Similarly, in the case of Pakistan, outbreaks mostly occurred in conflict-affected populations, especially during people displaced. Thus, it has a catastrophic effect on the mortality and morbidity rate of the population of the country. According to a survey report, approximately 2/3 of deaths are caused by infectious disease [4]. However, the recent outbreak increased the death toll more than previous disasters. Second, the increasing number of death factors from communicable diseases is malnutrition, which is more common among IDPs of conflict-affected areas [5]. In fact, natural disasters rarely cause epidemic outbreaks due to minimum displacements of the population. Historically, natural disasters are not common to large-scale displacements of the population [3], which may pose little risk for communicable outbreaks.

Risk factors for transmission of communicable diseases:

There are many factors that may contribute to the transmission of communicable disease within the population. As in the case of COVID-19, the risk of transmission lacked the provision of appropriate health services for handling this challenging situation. For instance, at the beginning of this pandemic, there were not enough kits for testing this disease to confirm the suspected cases. There was a low capacity of policies for implementation regarding public awareness regarding proper follow-up of COVID-19 SOPs. The pandemic was highly communicable, and the people mostly did not follow preventive measures to cope with the disease. Likewise, the confirmed cases needed isolation units in each health care facility, but the existing capacity for coping was very low for confirmed cases. Although the government and nongovernment authorities were in continuous struggle to control the outbreak and for this purpose they established some centers for quarantine, the spread of disease was very rapid, and they were unable to fulfil the basic needs in these centers. Furthermore, the rapid onset and exposure of a large population to this catastrophe make these quarantine centers overcrowded. The limited capacity of public health authorities was unable to fulfil basic health needs there. Similarly, the risks for outbreaks of diarrhea after disaster are greater in less developed countries than in developed and industrialized countries [6], in Muzafarabad Pakistan, the outbreak affected more than 750 cases of infectious diarrhea, which caused poor management in camps of 1800 people after the 2005 earthquake. The affected persons were mostly adults and were mostly controlled after the provision of an adequate supply of water and sanitation [7]. However, due to COVID-19, developed and developing countries were desperately affected. In developed countries, the health system

was overburdened due to this outbreak, and the death toll was recorded to be very high compared to previous disasters.

Overcrowding and associated diseases: Overcrowding is mostly associated with displaced people during natural or manmade disasters. Crowding is the most contributing factor in the spread of infectious disease. The most recent example is COVID-19, where the disease was mainly spread due to an overcrowded situation. Although lockdown was in place, the authorities were still unable to make it successful due to daily routines. Social distancing maintenance was most needed as a precautionary measure for controlling the outbreak, but due to the large number of affected populations, the spread of the disease remained very high. Similarly, other infectious diseases, such as measles outbreaks, are mostly associated with disaster events, but the main factor is immunization among children less than 15 years old in the affected population. After the 2005 earthquake in Pakistan, 400 cases of measles were clinically reported within six months of the earthquake [8]. Similarly, meningitis is also spread through close person-to-person contact in cases of overcrowding. Most of the outbreaks spread within displaced people in Pakistan and Aceh [9]. In addition, acute respiratory infections (ARIs) are most common, particularly among displaced populations. The most susceptible group for acute respiratory infections is children, especially those aged less than 5 years. Furthermore, the scarcity of antimicrobial therapy and approaches to existing health facilities may further worsen the health status of people and increase the risk of death. In addition, in the case of Nicaragua after the incident of Hurricane Mitch in 1998, the rate of the reported incidence of respiratory infections were increased fourfold [10]. Similarly, ARI accounted for the highest number of deaths and morbidities due to the large displaced population during earthquake 2005 in Pakistan [8].

Vector borne disease

Most natural disasters, particularly cyclones, flooding and hurricanes, may cause vector-borne disease. Heavy rainfall may result in standing water, which can create breeding sites that may result in potential for disease transmission. The spread of vector-borne disease depends upon susceptible hosts, crowding of infected inappropriate public health infrastructure and disruption of disease control programs [11]. The most common is malaria outbreaks in the wake of flooding.

Direct Impacts on Health System

Hospitals and health care centers are also subjected to the same destructive forces of disaster; for example, power cuts related to disasters may affect health facilities to properly function. Disruptive activities may include cold chain and vaccine preservation. In addition, damage to physical infrastructure may adversely impact the health care system. Examples of structural and nonstructural damage include eighteen hospitals suffering from the Northridge earthquake. Several hospitals had evacuated patients, and some were seeking emergency care and were unable to treat patients.

Loss of personnel during disaster

Buildings and health care workers have the potential to be affected during disasters. Like during COVID-19, health care workers were front-line worriers in hospitals and communities. Most of them were affected, and some of them sacrificed their lives while saving other

lives. During this pandemic, a huge number of health care workers were affected by this fatal disease. A survey was conducted by the Department of Public Health Los Angeles County from February to May 2020 (LACDPH) to understand the impacts of COVID-19 on health care workers. During these three months, the pandemic affected almost 5500 positive health care workers, representing 9.6% of all positive cases. Keeping in view these personnel keep the existing health care system operations, which may further deteriorate the health care facility coping capacity to overcome these pandemics. Similarly, in Pakistan, health care workers are likely working for long hours and are mostly at risk of infection of this disease. Based on US data (February 12th to April 9th 2020), approximately 9282 cases were confirmed with this fatal outbreak. Furthermore, there were shortages of personal protective equipment (PPE) for these HCWs to combat this catastrophe, which further exposed a huge number of HCWs to exposure to a disease. Similarly, whenever a disaster strikes a region, health care providers can lose that their family members have damage to their residence or are injured. They also need time to cope their own needs. Therefore, these needs usually exceed the ability of the concerned health delivery system. Furthermore, the psychological aspect is one of the most important factors for health care workers while handling these catastrophes. During COVID-19, health care workers were working for a long hours under substantial pressure; thus, they were more vulnerable to psychological issues such as depression, fear, stress and anxiety [12]. Moreover, their close contact with infected patients with close contact is also a concern for their family transmission.

Indirect Impacts of Disaster on Population

Indirect effects mostly result from direct health impacts. When a natural disaster strikes a health care system, it can have significant impacts on public health in disaster-affected areas. The population has basic health needs that, if not met, may unfavorably impact human health. Likewise, during this pandemic outbreak, all the potential and attention were towards controlling this disaster. For this purpose, different strategies, such as lockdown, have been applied globally to control this infection. On the other hand, it could have affected the management of chronic diseases such as diabetes, cardiac diseases and hypertension as well as immunization and prenatal care needs. Moreover, a study conducted in Los Angeles found that 21% of households have at least one member who used and needs prescribed medications. In the same way, due to the failure of pharmaceutical services, those prescriptions may be affected.

Indirect Impacts of Disasters on Health Care System

The healthcare system also indirectly affects the population, similar to the indirectly affected population. Usually, indirect impacts mainly result from increased usage of healthcare system relies.

External infrastructure damage

Although external infrastructure damage has no direct impacts, individuals and businesses may be affected through damage to infrastructures such as roads, water supply and lifeline damage. Similarly, all natural disasters have serious impacts on the lifeline upon which the health care system strongly depends. Moreover, the transportation and communication sectors had serious impacts

on public health. In addition to public health sector reporting surveillance of communicable disease, this function may decrease due to disruption in communication and transportation infrastructures. The surveillance reporting efforts of communicable disease decreased to 30% instead of 70% prior reporting, which hindered the capability to quickly respond and cope to any health-related crisis [13].

Discussion

It is an undeniable fact that fear of highly infectious outbreaks has shaped the insight of the public and policy makers. The most recent example is COVID-19, which remained the most fatal pandemic in this century. The disease disrupts almost every aspect of life with a massive transmission rate [14]. On the other hand, the COVID-19 vaccine campaign has already started globally, but similar to the WHO-recommended vaccine against communicable diseases, there have been many challenges before. In most developing countries, such as Pakistan, new cases of polio still occur, which is one of the vaccine preventable diseases. For this purpose, we currently conducted a study on immunization barriers among children less than five years of age in the Dir Lower KP district. After analysis of the data, it was concluded that there were many factors that resulted in immunization barriers against WHO-targeted infectious diseases. These factors mainly included a lack of information; 58.3% of children were not immunized or were partially immunized because they did not have enough information about immunization. Moreover, the data indicated that 25.9% of the children remained unimmunized due to lack of motivation, and some of them were not immunized due to various obstacles in immunization (----). Similarly, the COVID-19 vaccine has prepared and started vaccination globally. As the study revealed that Pakistan is facing problems in child immunization, there are still many barriers and false rumours about these vaccine preventable diseases [15]. We may expect the same barriers and false rumours against the COVID-19 vaccination campaign. If the campaign against this fatal disease remains unsuccessful, it will shape as endemic in most of the country regions. For this purpose, the health sector needs to make a comprehensive plan for vaccination to overcome this catastrophe [16].

Furthermore, the chances of natural outbreaks are minimal after incident, but the occurrence is very high among internally displaced persons. Most communicable disease outbreaks are due to a lack of safe water and sanitation facilities and poor access to basic human needs, inappropriate primary health care services and inadequate shelters, as these conditions may exacerbate the health status of the population and may result in multiple communicable disease outbreaks. For better management of health issues and their impacts on public health, these conditions must be addressed immediately, with rapid health assessment of health care facilities. Additionally, the living conditions of IDPs, especially in conflict-affected populations. An adequate water supply, basic human needs and provision of an effective health care system should be developed, as these are crucial [17,18]. In addition, an effective early warning system and surveillance to detect epidemic outbreaks on time are more likely to occur after disaster-affected areas. Correspondingly, a comprehensive assessment of communicable disease based on risk assessment can determine the priority to overcome fatal disease. The need for immunization against preventable communicable diseases and vector control campaigns should be implemented. Likewise, disaster-

related injury disabilities and deaths are overwhelmingly due to the initial traumatic effects of the events. To minimize these impacts, an appropriate disaster preparedness plan should be formulated. This may strengthen comprehensive planning and focus on mass casualty incident management. The disaster-affected population and its needs for survival should be taken into account. As most of the population is affected due to unavailability of adequate water supply and access to health services, they require effective management and planning in terms of preventive and therapeutic interventions. For instance, provision adequate water, rehydration therapy, measles vaccination and antimicrobial agents. Apart from these, an effective surveillance system within the population affected by disasters is basic to address and control the occurrence of communicable outbreaks, injuries and deaths (John T et al 2007). Relevant surveillance information, however, has recently been very challenging. because, during the emergency phase, different government and nongovernment agencies are involved, and due to a lack of appropriate surveillance, coordination challenges and gaps between them are mostly created. For this purpose, continuous identification and treatment of infectious diseases are necessary to screen the occurrence and cause of outbreaks to report the effects and implement preventive and curative measures to cope with these outbreaks.

Conclusion and Recommendations

The consequences of natural disasters on public health are complex. However, the current pandemic shows that the health care delivery system is underfunded. The capacity of the existing health care delivery system is beyond coping with volatile situations such as COVID-19. This overburdened and collapsed the flimsy existing health care setup of the country. Furthermore, the direct impacts of disasters on population health result in acute conditions and physical injuries that may further create emotional stress. In addition, the impacts of disasters on the health care system may deteriorate the health status of the population due to stress on the existing resources, which may grossly increase the mortality and morbidity rates associated with communicable and chronic diseases. To reduce the intensity of these factors, the following recommendations should be implemented to strengthen health services and enhance public awareness.

The greatest factor that may lead to reduced mortality and morbidity rates from disasters needs a strong public health infrastructure. Health provision organizations should be prepared to be effective in managing calamities such as COVID-19. In addition, the health system should conduct routine surveillance, effective and timely EWS of epidemic outbreaks, immunization coverage of vaccine preventable disease and maintenance of adequate environmental control to cope with these issues effectively.

Similarly, effective policies should be implemented for the implementation of SOPs regarding specific diseases, such as public education and awareness regarding COVID-19 SOPs (hand washing, wearing masks and social distance). Furthermore, displaced people need close attention because of exposure to multiple factors in camps. The most important is the provision of safe water, hygiene and food supply, proper sanitation facilities, and provision of therapeutic and preventive intervention, ORS, and antibiotics.

Additionally, public awareness and communicable disease

guideline campaigns regarding personal hygiene, personnel safety and good health practices supported by effective water and sanitation activities should encourage people to prevent the spread of communicable diseases and injury. As a saying, prevention is better than cure.

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