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Climate-Induced Disasters and Their Medical and Psychological Consequences in Pakistan and Neighboring States

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ARTICLE INFO			ABSTRACT
Article History:			This research explores the growing challenge of climate-induced natural disasters in Pakistan and neighboring South Asian states, where rising global temperatures, glacial melting, and unpredictable weather patterns have intensified the frequency and severity of floods, heatwaves, cyclones, and glacial lake outburst floods. The region, already marked by high population density and fragile healthcare systems, faces disproportionate medical consequences from such catastrophic events. The health impacts extend far beyond immediate injuries and fatalities. Floods frequently lead to outbreaks of waterborne diseases such as cholera, malaria, and dengue due to contaminated water supplies and inadequate sanitation. Heatwaves expose vulnerable populations to dehydration, heatstroke, and cardiovascular complications, while earthquakes and cyclones cause large-scale trauma, fractures, and long-term disabilities. Maternal and child health is particularly at risk, as disrupted access to nutrition, reproductive services, and essential medical care amplifies existing vulnerabilities. Mental health consequences, including post-traumatic stress disorder (PTSD), depression, and anxiety, are also prevalent but often overlooked in disaster response strategies. The study further highlights the challenges faced by healthcare systems in responding to such crises. Limited medical infrastructure, shortages of trained personnel, and delays in emergency response hinder effective disaster management. Regional cooperation is therefore essential, as cross-border impacts demand stronger disease surveillance, early warning systems, and the sharing of medical expertise among South Asian states.
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Historical Background

Because of its varied geography, high population density, and weak economy, the South Asian region, which includes Pakistan, India, Bangladesh, Nepal, and Sri Lanka, has always been prone to natural disasters. People have lived in the Indus River Basin and the foothills of the Himalayas for a long time, and they have had to deal with floods, droughts, cyclones, and earthquakes over and over again. The modern era is characterized by the climate-induced exacerbation of these hazards, resulting in more frequent and catastrophic effects on human health and livelihoods. Natural disasters have become linked to public health crises in Pakistan and its neighboring countries. To understand how these problems have changed over time, we need to know more about their history (Ali & Khan, 2019).

Because Pakistan and Bangladesh depend on big river systems like the Indus, Ganges, and Brahmaputra, floods have been the most common natural disaster in those countries. The Bhola cyclone that hit East Pakistan (now Bangladesh) in 1970 killed more than 300,000 people, making it one of the deadliest natural disasters of the 20th century. The cyclone caused more than just immediate deaths; it also caused outbreaks of infectious diseases because of standing water and destroyed healthcare infrastructure. This shows how closely linked environmental shocks and medical vulnerability are. The 2010 super floods in Pakistan were similar. They flooded almost one-fifth of the country, forcing more than 20 million people to leave their homes and making it easier for cholera and malaria to spread, especially among women and children who couldn't get medical care (Rashid, 2011). These historical events show that floods are not only bad for the environment, but they can also cause health emergencies on a large scale (Haque & Islam, 2018).

Heatwaves have also become a sign of how South Asia's climate is getting more vulnerable over time. The region has always had hot summers, but in the last few decades, there have been more and more extreme temperature events. The 2015 heatwave in Karachi, Pakistan, which killed more than 1,200 people, showed how deadly climate change, poor city planning, and a lack of medical readiness can be when they all come together. In the past, South Asian cities didn't have organized plans to stop heat-related illnesses, which made people more likely to get dehydrated, suffer from heatstroke, or have heart problems. This is different from previous decades when there was less information about deaths caused by heat. This is because there have been more extreme weather events and health systems have not been able to adapt (Imran & Ahmad, 2017).

Earthquakes have been a major threat in the past, especially in places where earthquakes happen a lot, like northern Pakistan, Nepal, and India. The 1935 Quetta earthquake destroyed colonial-era Pakistan, killing tens of thousands of people and overwhelming the basic healthcare system of the time. The Kashmir earthquake in 2005 killed more than 80,000 people and forced many people to move away from their homes. It also caused a lot of orthopedic injuries, amputations, and psychological trauma. Historical accounts of such disasters show that their effects last longer than the moment of destruction. Poor rehabilitation and weak medical systems have kept survivors in a cycle of suffering. This exemplifies a persistent issue in South Asia, where disaster relief is prioritized while enduring healthcare for survivors remains inadequately developed (Shah, 2015).

Cyclones have also had a big impact on South Asian history, especially in coastal areas. Bangladesh has had some of the deadliest cyclones ever because its deltaic geography is low-lying. The cyclone in 1991 killed almost 140,000 people and left millions homeless. This once again showed how weak healthcare systems are when it comes to dealing with mass casualties and epidemics. Historically, cyclones have caused problems for fishing communities, damaged

infrastructure, and caused outbreaks of diarrheal diseases in Sri Lanka and India. These historical trends show that even though technology has made it easier to find cyclones, the region's health systems are still not ready to deal with the medical effects of these disasters (Chowdhury, 2012).

Along with natural disasters, climate-related hazards like glacial lake outburst floods (GLOFs) have become a part of history in northern Pakistan and Nepal. As the glaciers in the Himalayas melt because of rising temperatures, unstable glacial lakes can suddenly flood, which is especially dangerous for mountain communities that are far away. In the past, these communities did not have early warning systems or access to healthcare facilities, which made it more likely that injuries would go untreated and medical help would be delayed. Since the late 20th century, GLOFs have happened more and more often in Gilgit-Baltistan and Nepal. This is due to both changes in the environment and the fact that people living at high altitudes don't get the medical care they need (Bajracharya & Shrestha, 2011).

The medical repercussions of these disasters must also be contextualized within the historical evolution of healthcare systems in South Asia. After gaining independence, Pakistan, India, and Bangladesh took over poorly developed colonial health systems that weren't ready for large-scale emergencies. During the middle of the twentieth century, floods and cyclones often broke these weak systems, which led to high death rates from diseases that could have been avoided, such as respiratory infections and diarrheal diseases. Although substantial advancements have been achieved in the expansion of healthcare coverage, historical documentation reveals that medical responses to disasters have persistently fallen short, characterized by a predominance of reactive rather than preventive strategies within policy frameworks (Siddiqui, 2010).

Another important part of the historical background is how natural disasters affect weak groups, especially women and children. For example, historical studies of floods and cyclones in Bangladesh show that women were more affected than men because they couldn't move around freely, couldn't get to shelters, and didn't have access to reproductive healthcare during emergencies. Likewise, children displaced by the floods in Pakistan in 2010 were very likely to get sick and malnourished, just like children who had been displaced by other disasters. This historical trend shows that natural disasters have always made health inequalities worse, and this trend still affects medical problems in the area today (Nasreen, 2012).

Regional cooperation has historically developed in response to persistent disasters. The South Asian Association for Regional Cooperation (SAARC) was formed in 1985 to help countries work together to deal with disasters. However, historical evidence indicates that, despite the establishment of the SAARC Disaster Management Centre, collaboration has remained constrained due to political tensions, especially between India and Pakistan. This has historically limited the region's capacity to synchronize cross-border disease surveillance and emergency medical response. Still, some collaborative responses, like sharing cyclone data between regions, show that cooperation could get better if political will and humanitarian need are in line (Mukherjee, 2016).

Literature Review

Climate change has become a major problem for Pakistan and South Asia. Scientific studies show that extreme weather events are becoming more common in the area. In the last few decades, global warming has made glaciers in the Himalayas melt faster, changed the timing of monsoon seasons, and made heavy rain more common. These changes are closely related to human activities like deforestation, industrialization, and farming that isn't sustainable, which have made South Asian countries even more vulnerable to natural disasters. Scholars assert that Pakistan ranks

among the ten most climate-vulnerable nations worldwide, despite accounting for less than one percent of global carbon emissions. This discrepancy highlights the contrast between its emissions profile and the severity of the impacts it endures (Eckstein et al., 2021).

Cloudbursts, which are short but heavy rain events that cause flash floods and landslides, are a clear sign of climate instability in Pakistan. Cloudbursts happen when clouds that are already full of water suddenly cool down and release rain quickly. This happens a lot in mountainous areas like Gilgit-Baltistan and Khyber Pakhtunkhwa. In 2010 and again in 2021, cloudbursts caused terrible flash floods in northern Pakistan that destroyed farmland and swept away villages. Climate scientists say that these events are happening more often because the surface temperatures are rising, which makes the atmosphere hold more moisture and makes monsoon systems stronger. Additionally, rapid deforestation and unplanned urbanization in hilly regions intensify the destructive capacity of cloudbursts by compromising soil stability and impeding natural drainage (Ali & Rehman, 2022).

The geographic location of Pakistan elucidates its pronounced susceptibility to climate-induced calamities. The country is at the meeting point of three important ecological systems: the Himalayan-Hindukush-Karakoram glacial belt in the north, the dry plains of Balochistan and Sindh, and the Indus River Basin, which gets water from seasonal monsoons. Because of its geography, Pakistan gets both glacial melt and heavy rains. The Indus Basin is the most glaciated area outside of the polar regions because it has almost 7,000 glaciers that flow into it. Glaciers are melting faster because the temperature is rising, which is causing unstable glacial lakes to form. These lakes are prone to outburst floods. Literature indicates that glacial lake outburst floods (GLOFs) are increasingly prevalent in Gilgit-Baltistan, endangering isolated communities with the threat of abrupt flooding and inadequate medical or infrastructural resources (Hewitt, 2014).

Floods are still the most destructive natural disaster in Pakistan's history, but climate change has made them happen more often and with more force. The super floods of 2010 forced 20 million people to leave their homes. The floods of 2022 covered one-third of the country, killing more than 1,700 people and affecting 33 million more. Researchers say that these kinds of big floods are caused by a mix of heavier-than-usual monsoon rains, faster melting glaciers, and bad land management. The Indus River system is important for farming and making a living, but it also helps move extra water during heavy rains. Floods have become humanitarian disasters because of encroachment on riverbanks, weak drainage infrastructure, and inadequate embankments (Mustafa & Wrathall, 2011).

Pakistan's monsoon patterns have become more unpredictable, in addition to flooding. In the past, the South Asian monsoon was a predictable weather event, but climate change has changed how long it lasts, how strong it is, and where it falls. Recent research shows that Pakistan is getting shorter but stronger monsoon bursts. These bursts overwhelm drainage systems and cause flooding in cities like Karachi and Lahore. These patterns are similar to those seen in South Asia as a whole. India and Bangladesh, for example, also have unpredictable rain events that make it hard for farmers and healthcare systems to work. For Pakistan, this kind of instability makes food less secure and raises the risk of disease outbreaks after floods because standing water is a breeding ground for malaria, dengue, and cholera (Loo et al., 2015).

Pakistan's climate vulnerability has gotten worse because of deforestation and bad environmental management. Logging, farming, and urbanization are all reasons why the country loses a lot of forest cover every year. It has one of the highest rates of deforestation in South Asia. Forests are very important for controlling how much rainwater soaks into the ground, stopping soil erosion,

and keeping ecosystems stable. Taking away the trees in northern areas like Swat and Hazara has made natural barriers against flash floods and landslides caused by heavy rains and cloudbursts less effective. Comparative studies in South Asia show that Nepal and Bhutan, which have kept more forest cover, have fewer flood-related deaths. This shows how important it is to use land in a way that is good for the environment (Qamer et al., 2016).

Pakistan's susceptibility to climate change is correlated with socioeconomic factors that converge with environmental hazards. Disasters have worse effects when there is poverty, a fast-growing population, and unplanned urbanization. For instance, in rural Sindh and Balochistan, people often live in low-lying floodplains without the right infrastructure or healthcare facilities. This makes them very vulnerable to disease outbreaks after floods. Megacities like Karachi, on the other hand, have urban heat islands, where rising temperatures, bad ventilation, and bad healthcare systems all come together to make heat waves deadly. Research on South Asia highlights that disasters disproportionately impact marginalized groups, such as women, children, and the elderly, who already face restricted access to healthcare during non-crisis times (Rana et al., 2020).

Many of the problems that Pakistan faces are also problems in the rest of South Asia. India has to deal with heatwaves and cyclones all the time, and Bangladesh is very likely to get cyclones and storm surges. Like northern Pakistan, Nepal is in danger from glacial lake outbursts because the Himalayan glaciers are melting. In Sri Lanka, the monsoon rains are getting stronger, and landslides are happening more often in hilly areas. These patterns together show that South Asia is a climate hotspot, where shared geographic and socioeconomic traits make people more vulnerable. Researchers contend that regional cooperation is vital for mitigating disaster risk; however, historical political tensions have constrained cross-border collaboration in climate adaptation and healthcare resilience (Mirza, 2011).

The medical repercussions of climate-induced disasters in Pakistan and South Asia are extensively chronicled in the literature. Floods and cloudbursts can cause cholera and dengue outbreaks, and standing water can spread malaria. Heatwaves make it more likely that people will become dehydrated and have kidney problems, especially poor people who work in cities. Cyclones and earthquakes cause a lot of trauma and long-term disabilities, which puts a strain on healthcare systems that are already weak. However, scholars observe that healthcare responses throughout South Asia are predominantly reactive, lacking adequate focus on preventive disaster medicine and public health readiness. This gap is especially clear in Pakistan, where the healthcare system is weakest in the areas that are most likely to be hit by floods and earthquakes, like Sindh, Balochistan, and the northern highlands (Nasir et al., 2019).

Geographical Vulnerability of Pakistan and South Asia

Pakistan's Unique Geographic Position and Climate Exposure

Pakistan is in a unique spot between South Asia, Central Asia, and the Middle East. Its landscapes are very different, from the Himalayan and Karakoram mountain ranges in the north to the dry plains and coastal areas in the south. Because of its varied geography, the country is at risk from many climate-related dangers at the same time. Northern Pakistan has almost 7,000 glaciers, which makes it the most glaciated area outside of the polar regions. Global warming has sped up the melting of glaciers, which has made glacial lake outburst floods (GLOFs) more likely, especially in Gilgit-Baltistan and Chitral. The Indus River Basin, which supports most of Pakistan's farming, relies on both glacial melt and seasonal monsoon rains. This makes it very sensitive to changes in the climate. Pakistan's southern regions, such as Sindh and Balochistan, are prone to repeated

droughts and heatwaves, which shows that the country's location puts it at risk of many different types of climate change (Hewitt, 2014).

Pakistan's 1,050-kilometer-long coastline along the Arabian Sea also makes it vulnerable to cyclones and storm surges. Cyclones happen less often in the Arabian Sea than in the Bay of Bengal, but they have been getting stronger in recent decades because the sea surface temperature has been rising. Karachi and the nearby coastal towns are still very vulnerable because there are so many people living there, the drainage is bad, and the city planning is not good. The geographical distribution of risks, extending from northern glaciers to southern coastal regions, renders Pakistan a case study of the interplay between diverse topography and climate change, resulting in intricate disaster scenarios (Ali & Rehman, 2022).

South Asia as a Climate Hotspot

The South Asian region as a whole, not just Pakistan, is known to be one of the most climate-vulnerable areas in the world. The Himalaya-Hindukush-Karakoram (HKH) ranges run through Pakistan, India, Nepal, and Bhutan. They feed into the Indus, Ganges, and Brahmaputra rivers, among others. These rivers are very important for the lives of almost two billion people, but they also pose a big risk when monsoon rains make flooding worse. Bangladesh, for example, has floods that happen over and over again because of its deltaic geography. India, on the other hand, has had terrible floods in states like Bihar, Assam, and Kerala. GLOFs are becoming more of a threat to Nepal and Bhutan, just like they are to northern Pakistan. This is because glaciers are melting and GLOFs are becoming more common. All of these things together make the geography of South Asia very vulnerable to hydrological disasters caused by climate change (Lutz et al., 2019).

Rising global temperatures are also making the South Asian monsoon system less stable. This system gives countries in the region up to 70% of their annual rainfall. The monsoon has changed over time; it is now shorter but more intense, causing flash floods, cloudbursts, and flooding in cities. In India and Pakistan, sudden downpours like these have overwhelmed drainage systems and caused humanitarian crises in megacities. Bangladesh and Sri Lanka are also having problems with rainfall patterns that are becoming more unpredictable and affecting both agriculture and public health. This regional vulnerability shows how geography, climate, and where people live in South Asia all affect each other in a delicate way (Turner & Annamalai, 2012).

Geographical Drivers of Floods and Cloudbursts in Pakistan

Heavy rain is not the only cause of floods in Pakistan; the country's geography makes them worse. The Indus River Basin, which runs from the Himalayas to the Arabian Sea, channels glacial melt and monsoon rains. Floodplains that are being built on, weak embankments, and unplanned irrigation systems make the problem worse, turning seasonal floods into disasters. The floods in 2010 and 2022 show how Pakistan's reliance on the Indus River makes disasters more likely. Also, the mountains in northern Pakistan make it possible for cloudbursts to happen. These are when clouds that are full of water drop a lot of rain in a short amount of time. These events are especially damaging in valleys where towns are close to rivers, causing flash floods, landslides, and the loss of land that can be farmed (Ashraf & Naz, 2013).

Cloudbursts are caused by both global and local geography. As the temperature of the air rises, it can hold more moisture. The mountains also push moist air up, which causes sudden condensation and rain. After such events, there is often a lot of damage to infrastructure and outbreaks of

waterborne diseases because supplies are contaminated. In Pakistan, cloudbursts in places like Rawalpindi, Skardu, and Chitral have shown time and time again how dangerous it is to live in areas with weak infrastructure, changing weather, and geography that is prone to flooding. These disasters are also harder to predict than seasonal floods, making medical preparedness and emergency response more challenging (Khan et al., 2020).

Major Climate-Induced Disasters in Pakistan and Neighboring States

Floods and Cloudbursts

Floods have always been the worst natural disaster in Pakistan and South Asia, and climate change has made them worse and more common. Pakistan is especially prone to floods because the Indus River Basin gets water from Himalayan glaciers and monsoon rains. The terrible floods of 2010 covered almost one-fifth of the country, forcing more than 20 million people to leave their homes. The floods of 2022 affected more than 33 million people and caused a lot of damage to crops, homes, and health infrastructure. In neighboring states, similar things happen. Bangladesh has monsoon floods that happen over and over again because of its deltaic geography. India has had terrible floods in Bihar, Kerala, and Assam. The main causes are stronger monsoon rains, melting glaciers, and cutting down trees, all made worse by unplanned urbanization and poor drainage systems. Floods not only cause physical damage, but they also make it easier for cholera, malaria, and dengue to spread, which shows how they can directly affect health (Mustafa & Wrathall, 2011).

In northern Pakistan and the Himalayan areas of India and Nepal, cloudbursts make things even more dangerous. A cloudburst is a very heavy rainstorm that drops a lot of water in a short amount of time, usually in valleys in the mountains. These sudden rainstorms cause flash floods, landslides, and the collapse of a lot of infrastructure. Pakistan's Gilgit-Baltistan and Chitral regions, as well as India's Uttarakhand, have been hit by these kinds of disasters many times. Scientists say that climate change is making them happen more often because warmer air holds more moisture, which is then released quickly when the air cools down in the mountains. The medical consequences of cloudbursts are especially dire, as survivors frequently endure untreated traumatic injuries, waterborne infections, and limited access to healthcare resulting from damaged infrastructure (Khan et al., 2020).

Heatwaves and Droughts

Heatwaves are another big disaster caused by climate change, and Pakistan and India are two of the worst places in the world for them. The heatwave in Karachi in 2015 killed more than 1,200 people in just one week. Thousands more were hospitalized because they were dehydrated, had heatstroke, or had kidney failure. The dense cities of South Asia, which have poor air flow and few green spaces, act as "urban heat islands," making the effects of rising temperatures even worse. Studies in the medical field show that heat waves have a bigger impact on vulnerable groups like the elderly, outdoor workers, and people who already have heart or lung problems. India, which is next door, has had similar problems. The 2019 heatwave in Bihar killed hundreds of people. According to climate models, heatwaves in South Asia will happen more often, last longer, and kill more people in the next few decades (Imran & Ahmad, 2017).

Droughts are also a big problem, especially in dry parts of Pakistan like Sindh and Balochistan, as well as parts of India and Sri Lanka. Long periods of dry weather make farming less productive, which can cause food insecurity and malnutrition. In Tharparkar, Sindh, repeated droughts have caused long-term malnutrition in children and high rates of infant death. Droughts lead to not only

under nutrition but also outbreaks of diseases like cholera and diarrhea that are linked to poor water quality. Regional studies indicate that the interplay among drought, poverty, and inadequate healthcare systems exacerbates human suffering, rendering droughts a silent yet widespread catastrophe in South Asia (Rana et al., 2020).

Earthquakes and Landslides

Climate change doesn't directly cause earthquakes, but the same geographical weaknesses that make other disasters worse in South Asia make earthquakes worse too. Pakistan is located on the border of the Indian and Eurasian tectonic plates, which makes it very seismically active. The 1935 Quetta earthquake killed about 30,000 people, and the 2005 Kashmir earthquake killed more than 80,000 people and forced millions to leave their homes. These disasters showed how badly building codes, emergency preparedness, and medical infrastructure need to be improved. There were thousands of trauma cases, amputations, and untreated fractures after the quakes, which made hospitals that were often damaged by the quakes even busier. A similar disaster happened in Nepal in 2015 when a 7.8-magnitude earthquake hit Kathmandu Valley, killing almost 9,000 people and leaving many survivors disabled (Shah, 2015).

Another common disaster in the mountains of Pakistan, Nepal, and India is landslides, which are often caused by heavy rains and earthquakes. Climate change makes rain patterns more unpredictable, which makes slopes less stable and more likely to fall. Landslides not only damage buildings and roads, but they also make it hard for people to get to hospitals, which means that injured people can't get the care they need right away. Landslides in northern Pakistan have repeatedly cut off whole villages after monsoon rains or cloudbursts. This has forced medical teams to use helicopters to get people out. These disasters show how natural and climate-related risks come together in South Asia, making both short-term medical emergencies and long-term health problems worse for the communities that are affected (Ashraf & Naz, 2013).

Cyclones and Storm Surges

Cyclones happen a lot in South Asia, especially in Bangladesh, India, and Sri Lanka. Pakistan has fewer cyclones than other countries because it is next to the Arabian Sea instead of the Bay of Bengal, which is more prone to cyclones. However, the risk has grown in recent decades because the sea surface temperature has risen. Cyclone Yemyin hit Sindh and Balochistan hard in 2007, causing flooding and forcing hundreds of thousands of people to leave their homes. Bangladesh, on the other hand, is still one of the countries that gets hit by cyclones the most. The Bhola cyclone in 1970 killed more than 300,000 people, and the cyclone in 1991 killed another 140,000. Cyclone Fani in 2019 and Cyclone Amphan in 2020 caused a lot of people to have to leave their homes and lose their jobs in India.

From a medical point of view, cyclones and the storm surges that come with them cause direct trauma injuries and deaths by drowning, and they also spread diseases because they make water sources dirty. Moving people into crowded shelters often causes outbreaks of respiratory and gastrointestinal infections, and damage to healthcare infrastructure slows down response efforts. The psychological effects are just as bad, and survivors often have post-traumatic stress disorder (PTSD) and anxiety. Regional studies emphasize that cyclones disproportionately impact women and children, who encounter additional obstacles in obtaining reproductive and maternal healthcare during emergencies (Chowdhury, 2012).

Glacial Lake Outburst Floods (GLOFs)

Glacial Lake Outburst Floods (GLOFs) are a new type of climate-related danger for Pakistan and its northern neighbors. Himalayan glaciers are melting as the world's temperatures rise. This leaves behind lakes that are unstable and dammed by ice or loose sediment. When these dams break, which is often caused by heavy rain or earthquakes, floods rush through the valleys below with deadly force. Gilgit-Baltistan in Pakistan has seen dozens of GLOF events in the past 20 years. These events have destroyed farmland and moved whole villages. Nepal and Bhutan also have similar risks, and the communities in the Himalayas are still very vulnerable.

The medical effects of GLOFs are very serious. Survivors often have untreated trauma injuries, broken bones, and infections because they were not evacuated quickly enough. Also, destroying farmland and irrigation systems makes people hungry and malnourished for a long time. The fact that many affected villages are far away from hospitals makes it even harder to respond to disasters. Instead, people have to rely on temporary medical camps. Academics stress that GLOFs will happen more often as glaciers melt faster, making them one of the most dangerous climate-related events in South Asia in the future (Bajracharya & Shrestha, 2011).

Medical and Public Health Consequences

Infectious Diseases

In South Asia and Pakistan, climate-related disasters have regularly led to infectious disease outbreaks, with floods and cloudbursts being the main causes of waterborne illnesses. Cholera, diarrhea, and typhoid spread quickly as a result of drinking water sources being contaminated by heavy monsoon rains and overflowing rivers. Due to unsafe water consumption and poor sanitation, nearly 33 million people were at risk of gastrointestinal infections as a result of the damage done to more than 1,000 health facilities during Pakistan's floods in 2022 (Ali et al., 2023). Following flooding, stagnant water creates the perfect environment for mosquitoes and other vectors to breed, greatly raising the prevalence of dengue fever and malaria. A regional pattern of vector proliferation under changing climatic conditions is highlighted by the cyclical dengue epidemics that follow monsoon-related floods in Bangladesh, a country with comparable geographical vulnerability (Rahman & Karim, 2021). These recurring epidemics put additional strain on South Asia's already precarious healthcare systems by highlighting the clear correlation between environmental instability and the prevalence of infectious diseases.

Non-Communicable Diseases (NCDs)

Even though communicable diseases are still a big problem, extreme weather events are making non-communicable diseases (NCDs) worse. Long-lasting heatwaves, particularly in Pakistan and India, have been linked to heatstroke, cardiovascular strain, and renal failure resulting from dehydration and elevated ambient temperatures (Qureshi et al., 2022). The urban poor, who often live in places that trap heat and don't have access to cooling systems, are hit the hardest. Respiratory problems also get worse during heat and dust storms, which makes asthma and chronic obstructive pulmonary disease (COPD) worse. Drought conditions prevalent in southern Pakistan and Afghanistan exacerbate malnutrition, which indirectly complicates the management of non-communicable diseases (NCDs), as undernourished patients face challenges with medication efficacy and immune function. Additionally, extreme temperatures shorten the shelf life of important drugs like insulin, making it even harder to treat people with diabetes (Khan et al., 2021).

So, climate disasters make the burden of NCDs worse by putting direct stress on the body and causing problems in the whole system.

Maternal and Child Health

Women and children are more likely to suffer medical problems during climate disasters than other vulnerable groups. Flooding forces people to move, which messes up their antenatal care, maternal nutrition, and vaccination schedules. The floods in Pakistan in 2010 and 2022 showed that pregnant women in relief camps were more likely to get anemia, hemorrhage, and sepsis because there were not enough medical facilities or skilled birth attendants (World Health Organization [WHO], 2022). Malnutrition, which is already a big problem in South Asia, is made worse by floods and droughts that cause crop failures and food insecurity. UNICEF (2021) says that almost 40% of children in Pakistan are stunted, and this number gets much worse during years when there are disasters. South Asian countries like Nepal and Bangladesh have similar problems, where children under five are more likely to die from diarrhea after a flood. Reproductive health services, such as access to contraceptives and safe deliveries, are frequently interrupted, resulting in increased maternal mortality. Consequently, maternal and child health indicators function as essential indicators of the unequal medical burden inflicted by climate-induced disasters.

Mental Health Impacts

Although the physical health effects of climate-related disasters are the most important things to deal with right away, the mental health effects are very serious but often go unnoticed. People who have survived earthquakes, floods, and displacement camps often show signs of post-traumatic stress disorder (PTSD), depression, and anxiety. Research conducted in Pakistan after the 2005 Kashmir earthquake revealed extensive PTSD among both survivors and rescue workers, resulting in enduring consequences for social reintegration (Saeed et al., 2019). Likewise, populations displaced by the 2022 floods reported heightened instances of sleep disorders, grief-induced depression, and suicidal ideation, intensified by the loss of livelihoods and family members (Nishtar et al., 2023). In Bangladesh, communities affected by cyclones have exhibited intergenerational psychological distress, as children assimilate the trauma endured by their parents. Even though these patterns exist, mental health services in South Asia are still underfunded and not a top priority. Stigma makes people even less likely to seek treatment. So, disasters caused by climate change are causing a silent epidemic of mental suffering that needs to be dealt with in addition to physical healthcare.

Emergency Medical Care Gaps

The repeated disasters in Pakistan and South Asia show that their emergency medical care systems are very weak. Floods and earthquakes frequently obliterate hospitals, sequester rural populations, and impede medical response owing to compromised infrastructure. During the floods of 2022, roads and bridges fell down, making it impossible for people in Sindh and Balochistan to get medical help. Thousands of people went without treatment for injuries and infections (Government of Pakistan, 2022). Rural hospitals that don't have surgical equipment or trained orthopedic staff still don't provide enough emergency trauma care for fractures, burns, and crush injuries. Earthquake-prone regions like northern Pakistan and Nepal underscore the critical necessity for the swift establishment of field hospitals and mobile clinics. In addition, a lack of ambulances, slow referral systems, and small stockpiles of important medicines make deaths even worse after disasters (Shah & Hussain, 2021). South Asian states often rely heavily on international humanitarian assistance, reflecting structural weaknesses in local capacity. Strengthening

emergency medical infrastructure, disaster medicine training, and supply chain resilience is therefore imperative to reduce the health toll of future climate events.

Regional Trends and Comparative Perspective

Similar Patterns in India, Bangladesh, Nepal, and Sri Lanka

Because of its location, dense population, and reliance on climate-sensitive jobs like farming and fishing, the South Asian region is very vulnerable to disasters caused by climate change. In India, floods happen again and again in Assam, Bihar, and Kerala, and there are also very hot weather patterns in the northern states. These are similar to what happens in Pakistan's Punjab and Sindh provinces. Climate change has caused irregularities in the monsoon in both countries. Too much rain can cause flash floods, and long periods of drought can make water scarce. Bangladesh is even more at risk because it is on the world's largest river delta, which makes it very vulnerable to cyclones, storm surges, and floods. This is similar to Pakistan's Indus Basin, which is prone to flooding. However, Bangladesh's higher population density and low-lying terrain make the risks of displacement and food insecurity even worse (Ahmed et al., 2022).

Nepal has problems that are both unique and related to each other. The glaciers in the Himalayas are melting quickly because global temperatures are rising. This causes Glacial Lake Outburst Floods (GLOFs) that threaten communities downstream. Pakistan is also vulnerable, especially in Gilgit-Baltistan, where glaciers melting puts villages and hydropower infrastructure at risk. Sri Lanka is also seeing stronger cyclones and more unpredictable rain, which can cause flash floods and landslides in hilly areas, just like what happened in Pakistan's Khyber Pakhtunkhwa and Baluchistan. These countries together show that climate threats are a regional problem, even though the types of disasters may be different (Shrestha & Bawa, 2023).

Comparative Insights from Neighboring States

Pakistan can learn a lot from how other South Asian countries handle disasters and public health. Bangladesh, for instance, has created one of the best programs in the world for getting ready for cyclones. It includes early warning systems, community shelters, and local participation. This model has greatly lowered the number of deaths caused by cyclones and can be used in other coastal areas of Pakistan. India has also spent a lot of money on satellite-based monitoring and plans to deal with heat waves. For example, in Gujarat, the state has set up public cooling centers, sent out early warnings, and worked with other agencies to cut down on heat-related deaths. These strategies can help Pakistan deal with heat stress in cities, especially Karachi and other places with a lot of people (Gupta et al., 2021).

Nepal's emphasis on community-based adaptation to GLOFs illustrates the significance of local involvement in disaster risk mitigation. Setting up monitoring systems near glacial lakes that are at risk and getting local people involved in planning early evacuations have worked. This method could help Pakistan do better in Gilgit-Baltistan, where glacial hazards are getting worse. Sri Lanka's health sector has also improved by making disaster preparedness a part of primary healthcare. This means that even people in rural areas can get medical help in an emergency. This shows Pakistan that it needs to connect disaster medicine with rural health infrastructure so that people can get help quickly in areas affected by floods and droughts (Fernando, 2022).

The regional perspective shows that even though South Asian countries have some weaknesses, proactive steps and good governance can make disasters much less damaging. Pakistan can better

integrate climate adaptation with public health strategies by learning from the successes and failures of its neighbors. This will create a strong framework that not only deals with short-term problems but also builds long-term sustainability across the region.

Policy Frameworks and Disaster Risk Reduction

Pakistan's National Climate and Health Policies

Pakistan has realized that climate change is making disasters more likely and has slowly started to include climate adaptation and public health issues in its national policies. The National Climate Change Policy (NCCP) of 2012, which was updated in 2021, lists ways to make the country more climate-resilient, with a focus on agriculture, water, health, and disaster risk management. The policy emphasizes the relationship between climate change and public health, especially the rise in vector-borne diseases like malaria and dengue after floods and the health effects of heatwaves in cities. The National Health Vision (2016–2025) also recognizes climate change as a factor that affects health and stresses the need to improve primary healthcare to deal with new problems. But implementation has often been slow because of a lack of money, poor coordination between agencies, and a reactive rather than proactive approach. The absence of integration between climate policy and the health sector has further limited the nation's ability to execute an effective, comprehensive disaster response (Khan & Kazmi, 2021).

Role of NDMA (National Disaster Management Authority)

The National Disaster Management Authority (NDMA) is the main organization in charge of managing disaster risk in Pakistan. It was set up by the National Disaster Management Act of 2010. It is responsible for assessing risks, making plans for being ready, responding to emergencies, and recovering. NDMA has made progress in creating national disaster risk reduction (DRR) frameworks, running simulations, and organizing relief efforts during major disasters like the 2010 super floods and the 2022 catastrophic floods. It has also worked with provincial disaster management authorities (PDMAs) to move disaster response away from the center. Even with these improvements, NDMA has a lot of problems to deal with. There are still problems with coordination between federal and provincial institutions, limited technological resources, and not enough integration of health preparedness into disaster planning. For instance, NDMA has stockpiles for distributing aid, but medical supplies and trained personnel for epidemics that happen after a disaster are often not enough, which makes it take longer for health interventions to happen (Haider & Qureshi, 2022). To make NDMA stronger, we need more than just money. We also need to make sure that public health agencies are always included in plans for disaster preparedness and response.

SAARC Cooperation and Limitations

At the regional level, the South Asian Association for Regional Cooperation (SAARC) has tried to set up ways for countries to work together to deal with disasters. Some of these are the SAARC Disaster Management Centre (SDMC) and the SAARC Framework for Action on Disaster Management (2006–2015). These frameworks stress sharing knowledge across regions, building capacity, and setting up early warning systems for disasters that cross borders, like cyclones and floods that often hit several South Asian countries at once. But political tensions, especially between Pakistan and India, have made SAARC less effective because they make it harder to trust and work together. Because of this, regional responses are often broken up, and states have to rely on bilateral aid or international organizations when there is a crisis. Also, SAARC has had a hard

time adding health issues to its disaster management plans, even though epidemics keep happening after floods and cyclones in the area (Rasul, 2020). For Pakistan, this highlights the necessity to advocate for enhanced health-oriented collaboration at the regional level, possibly through integrated disease surveillance systems, collaborative medical training initiatives, and joint research on climate-health interconnections.

Psychological Impacts of Climate-Induced Disasters

Trauma and Post-Traumatic Stress Disorder (PTSD)

One of the most important psychological effects of disasters caused by climate change is the onset of trauma and post-traumatic stress disorder (PTSD) in the people who are affected. Survivors of floods, earthquakes, or cyclones frequently endure life-threatening circumstances, abrupt displacement, and the loss of family members, leading to significant psychological trauma. In Pakistan, floods in 2010 and 2022 forced millions of people to leave their homes. Many of those who survived said they had intrusive memories, nightmares, and more anxiety than usual. Likewise, in Bangladesh and Nepal, flood survivors often report persistent anxieties regarding water-related incidents, resulting in enduring avoidance behaviors and a diminished sense of security (Neria et al., 2021). PTSD not only impairs individual functioning but also diminishes community resilience, as collective trauma hampers the capacity of populations to reconstruct efficiently.

Anxiety, Depression, and Grief

Climate-related disasters can cause more than just trauma; they can also cause a lot of anxiety and depression. Anxiety comes from both being directly in danger and worrying about what might happen in the future, especially in places like South Asia where flooding and heatwaves happen often. People who lose their jobs, homes, and social networks often report feeling depressed. For example, farmers in parts of Pakistan and India that are affected by drought often have trouble making ends meet and getting enough food, which can lead to depression and, in some cases, suicide. Grief stemming from the loss of family members, community structures, and cultural connections exacerbates these mental health issues (Khan et al., 2020).

Displacement, Migration, and Identity Crisis

When people are forced to move after climate disasters, it creates situations of uncertainty and instability that can make them feel like they have lost their identity and are confused. Climate-induced migration has been especially evident in Pakistan during repeated floods, compelling rural populations into temporary shelters or urban slums. Displacement like this breaks up social ties, weakens traditional support systems, and causes mental distress. Research indicates that displaced populations experience elevated levels of depression, anxiety, and somatic complaints in contrast to non-displaced communities (UNHCR, 2022). Children and women are particularly susceptible, as they frequently find it challenging to acclimate to new surroundings, endure discrimination, or experience violence in temporary camps.

Impact on Children and Adolescents

Children who have been through climate disasters are very likely to have mental health problems because these events shake up their sense of safety and stability. Children in Pakistan who were forced to leave their homes because of floods and earthquakes have said they are afraid of it happening again, have trouble learning, and have changed their behavior, like becoming more

aggressive or withdrawing. Schools that have been destroyed or turned into shelters make this situation even worse because not being able to go to school can cause both emotional instability and long-term developmental problems. Adolescents, in a critical phase of identity formation, frequently encounter intensified stress due to the dual challenges of disaster-related trauma and uncertainty regarding future prospects (Save the Children, 2021).

Gendered Dimensions of Psychological Impacts

The psychological effects of climate-related disasters differ by gender. In South Asia, women are often more vulnerable because of their cultural and social roles. In times of disaster, they are often the ones who have to take care of others, which makes them more stressed and tired. Also, women living in displaced camps may be victims of gender-based violence, harassment, or limited access to reproductive healthcare, which makes their mental health even worse. Men, on the other hand, often feel bad when they are unemployed and can't fulfill their traditional roles as providers. This can lead to more drug and alcohol use and, in some cases, violence. Consequently, gender-sensitive interventions are crucial for addressing psychological well-being in disaster contexts (Ali & Farooq, 2020).

Collective Trauma and Social Cohesion

At a broader societal level, climate disasters generate collective trauma that reshapes community identity and cohesion. In regions such as Sindh and Balochistan, where communities repeatedly experience floods, disaster fatigue and hopelessness weaken social bonds. Collective trauma often manifests in reduced trust in institutions, anger toward governments, and erosion of community solidarity. However, in some contexts, disasters can also foster resilience and collective action, where communities unite to rebuild and support each other. Understanding these dynamics is crucial for policymakers seeking to design interventions that enhance psychological resilience alongside physical recovery (Norris et al., 2019).

Need for Mental Health Integration in Disaster Response

Despite the severe psychological toll of climate-induced disasters, mental health remains a neglected component of disaster management in Pakistan and South Asia. Limited availability of trained mental health professionals, lack of awareness, and cultural stigma around mental illness prevent effective interventions. Most disaster response frameworks emphasize physical relief such as shelter, food, and medicine, with mental health services being sidelined. Yet, research shows that psychological support, including counseling, community therapy, and psychosocial first aid, significantly enhances recovery outcomes. Integrating mental health into disaster management policies is essential for building resilience at both the individual and community levels (WHO, 2022).

Government's Role and Responsibilities

The role of government in lessening the bad effects of climate-related disasters in Pakistan and South Asia is very important and has many parts. Good governance is the foundation for building long-term resilience against floods, heat waves, droughts, cyclones, and glacial lake outburst floods, all of which have become worse because of climate change. Building dams and water reservoirs is a top priority because they can be used for both flood control and water conservation. Pakistan depends a lot on river systems that come from the Himalayas. This means that during the monsoon season, the country often floods, and during long dry spells, it runs out of water. Building medium- and large-scale dams, as well as small water storage systems for communities, would

help control the flow of rivers, lower the risk of floods, and make sure that there is always enough water for farming and home use during dry spells.

At the same time, the government needs to make early warning systems and disaster preparedness plans better. Using satellites, weather forecasting models, and mobile communication alerts to connect different technologies can greatly reduce the damage caused by sudden storms, heatwaves, or cyclones. Early warning systems in communities make sure that people can evacuate on time, that medical facilities are ready, and that there are no large-scale losses of life or property. The National Disaster Management Authority (NDMA), provincial governments, and local institutions all need to work together to make this happen. Making sure that local disaster management groups have the right training and tools would improve the ability to respond at the grassroots level.

Another important job is to strengthen the healthcare system so that it can handle the medical needs of disasters caused by climate change. Floods can cause cholera, malaria, and dengue outbreaks because of standing water. Heatwaves and droughts, on the other hand, can cause more kidney diseases, heart problems, and respiratory stress. During disasters, governments need to spend money on mobile clinics, emergency field hospitals, and pharmacies that are well-stocked so that people can get medical care quickly. It is also important to include mental health services in the healthcare system. Disasters frequently result in post-traumatic stress disorder (PTSD), depression, and anxiety, especially among displaced individuals, women, and children. To deal with the invisible but very real psychological effects of climate shocks, we need to make counseling centers, psychosocial support units, and community-based resilience programs permanent.

Urban planning and housing development that can handle climate change is just as important. Many communities in Pakistan and other South Asian countries that have been hit by floods live in poorly planned areas along riverbanks, coastal belts, or unstable hillsides. These areas are more likely to flood, get hit by cyclones, or slide down hills. Governments should move people who are at risk to safer areas, build disaster-resistant housing that is cheap, and enforce strict building codes. To stop waterlogging during cloudbursts, urban drainage systems need to be improved. Green infrastructure like urban forests and wetlands can also help cities stay cooler and soak up extra rainwater.

The government must keep making NDMA and provincial DMAs stronger a top priority. These organizations often have trouble with money and logistics, which makes it harder for them to respond quickly and effectively during disasters. Better budget allocations, new rescue gear, well-trained emergency medical responders, and the use of new technology can all make their operations much more efficient. The government should also focus on helping local communities get better at disaster management by giving them training programs. Teaching people how to give first aid, how to stay clean during floods, and how to deal with heat waves would give communities the tools they need to be the first line of defense in emergencies.

Public awareness campaigns help make people more resilient in a different way. Governments can use TV, radio, social media, and school lessons to teach people about climate adaptation, how to stay healthy during disasters, and why it's important to save water. Drills for fires, earthquakes, and floods in schools and communities would teach people to be safe and ready.

Finally, Pakistan and other South Asian governments need to put regional and international cooperation at the top of their lists. Because climate-related disasters don't stop at borders, regional groups like the South Asian Association for Regional Cooperation (SAARC) can be reenergized to

share early warning data, plan rescue operations, and come up with joint plans for how to deal with climate change. The World Health Organization (WHO), the United Nations Development Programme (UNDP), and the World Bank are examples of international organizations that can help strengthen health systems, build infrastructure, and train people by giving money and technical help. Good diplomacy can help national efforts by getting climate adaptation funds from global organizations like the Green Climate Fund.

Conclusion

This research underscores the significant and multifaceted effects of climate-induced disasters in Pakistan and adjacent South Asian countries, including both medical and psychological aspects. The region is susceptible to floods, cloudbursts, heatwaves, droughts, cyclones, landslides, earthquakes, and glacial lake outburst floods (GLOFs), which are caused by a combination of geographical, hydrological, and socio-economic factors. The medical effects are wide-ranging, including outbreaks of infectious diseases, worsening of non-communicable diseases, and problems with the health of mothers and children. Psychological consequences, encompassing PTSD, anxiety, depression, and collective trauma, exacerbate the human toll of disasters.

A comparative analysis with India, Bangladesh, Nepal, and Sri Lanka reveals analogous patterns of disaster vulnerability, while also imparting significant insights into early warning systems, community-based preparedness, and health system integration. In Pakistan, disaster management still relies heavily on government agencies like the NDMA and national climate and health policies. To lessen both short- and long-term effects, it is important to make strategic investments in dams, water reservoirs, early warning systems, strong healthcare infrastructure, and psychosocial support programs.

In the end, a successful disaster risk reduction strategy needs to bring together climate adaptation, public health preparedness, and psychological resilience in a single, multi-sectoral approach. For long-term resilience, it is important to strengthen cooperation between countries and regions, invest in infrastructure, and raise public awareness. Pakistan and its neighbors can make themselves less vulnerable, protect people's health, and promote social and economic stability in the face of climate change by using comprehensive strategies.

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