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REVIEW ARTICLE

Climate change, disability, and physical and rehabilitation medicine: A call for inclusive health action

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Abstract

Background: Climate change is an escalating global health emergency with widespread and disproportionate effects on populations. Despite representing over one billion individuals worldwide, people with disabilities (PwD) remain largely overlooked in climate adaptation and health planning. The health consequences of climate change for PwD are multifaceted and profound. This article aims to elaborate on the intersection of climate change and disability, explore the disproportionate impacts of climate change on PwD, emphasizing the pivotal role of Physical and Rehabilitation Medicine (PRM) professionals.

Methods: This narrative review synthesizes expert perspectives to examine the intersection of climate change, disability, and health. A focused review of literature identified key themes and policy gaps, complemented by conceptual analysis highlighting the implications for PRM.

Results: The complex interplay between climate change and disability is shaped by environmental stressors, health system disruptions, and pre-existing functional limitations. Evidence suggests that during climate-related events, PwD experience disproportionate impacts, including heightened morbidity, barriers to accessing essential services, and greater socio-economic and psychosocial vulnerability. PRM professionals are uniquely positioned to respond to the challenges of climate change through their expertise in functional restoration, long-term care, and disability-inclusive health services. However, rehabilitation remains underrepresented in many national and international climate response frameworks. The integration of rehabilitation into climate-resilient health systems requires all-inclusive governance, adaptive infrastructure, workforce capacity building, disability-focused research, and strengthened global partnerships.

Conclusion: There is an urgent need to embed rehabilitation within climate change policies to ensure equitable, sustainable, and inclusive health systems. PRM professionals have a pivotal role in shaping and implementing these strategies, advocating for the rights and needs of PwD in the evolving climate crisis. A structured roadmap for climate-resilient, rehabilitation-inclusive health systems is essential to achieve health equity and resilience for all.

Key messages

Climate change is a major health crisis, disproportionately affecting vulnerable populations, especially people with disabilities, due to physiological, mobility, and socioeconomic challenges. Physical and Rehabilitation Medicine professionals can play a vital role in mitigating these impacts through care, education, and advocacy. Global collaboration amongst all stakeholders is essential to build climate-resilient, rehabilitation-inclusive health systems.

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Introduction

The intergovernmental Panel on Climate Change defines climate change as "any change in climate over time, whether due to natural variability or as a result of human activity" [1]. Climate change is widely recognized as one of the most significant public health emergencies of the 21st century, with over 3.3 billion people living in contexts highly vulnerable to climate hazards [1, 2]. Its effects are felt globally, with projections indicating a steady intensification of extreme weather events, rising sea levels, food and water insecurity, forced displacement, and environmental degradation, which pose critical risks to health and well-being [3].

The World Health Organization (WHO) estimates that between 2030 and 2050, climate change will contribute to an additional 250,000 deaths annually due to heat stress, malnutrition, vector-borne diseases, and diarrheal illnesses, etc., with associated direct health costs expected to reach between US$2 to 4 billion per year by 2030 [2]. These projections do not account for indirect impacts and socio-economic burden, such as the collapse of health infrastructure, mental health deterioration, and displacement-related trauma, which disproportionately affect vulnerable populations. The recently published 'The 2025 Lancet Countdown' report highlights that climate change is already exerting significant and measurable impacts on global health [4]. The report indicates that heat-related mortality has increased by an estimated 63% since the 1990s, with approximately 546,000 deaths annually from 2012–2021 [4]. Furthermore, it documents a widening spectrum of climate-related health risks, including increased exposure to wildfire-related air pollution, deteriorating food insecurity, heightened vulnerability to climate-sensitive infectious diseases, and substantial reductions in economic productivity [4].

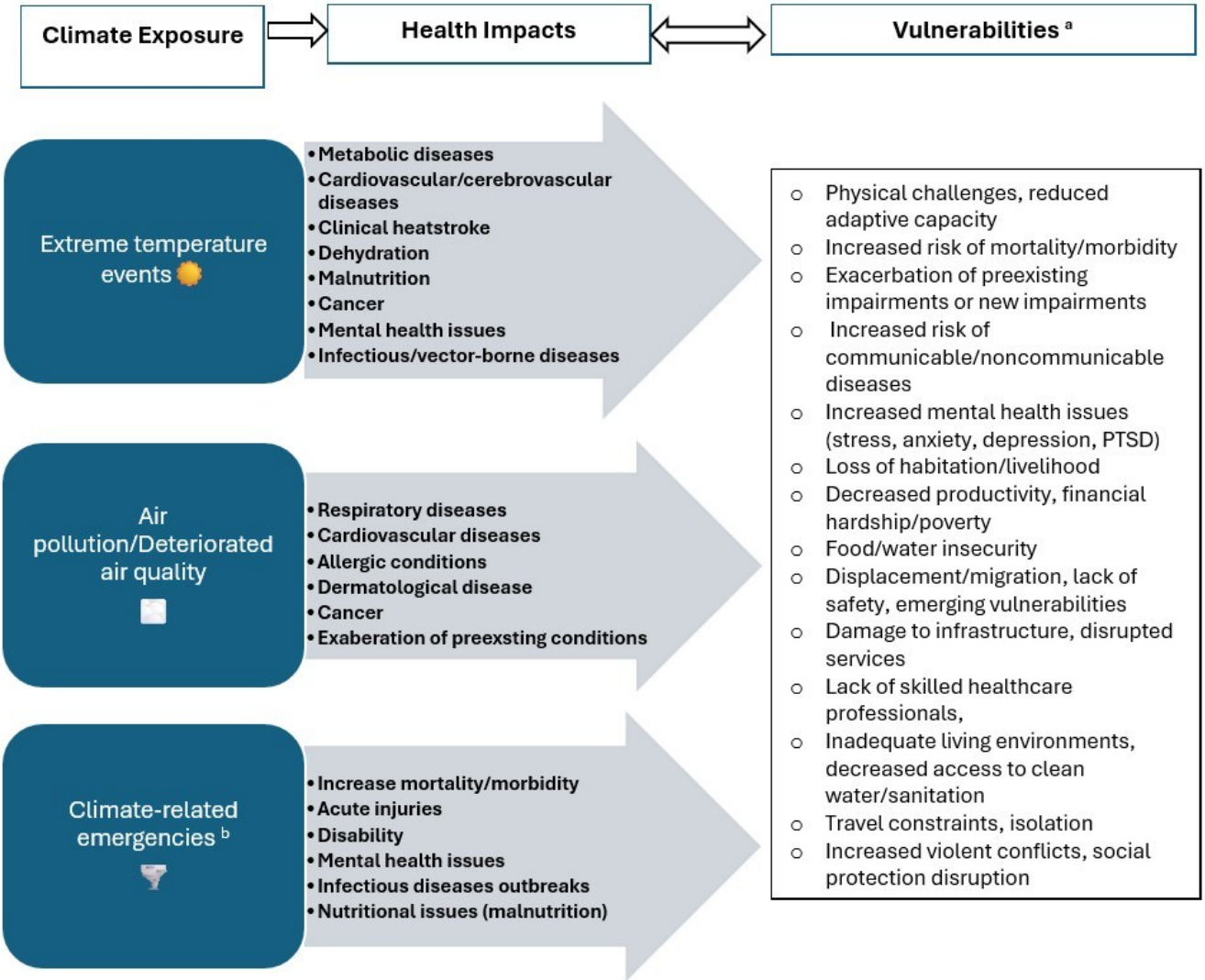
Climate change has profound impacts on human health, particularly for vulnerable populations such as individuals with pre-existing health conditions, older adults, children, low-income communities, and people with disabilities (PwD) [5, 6]. PwD represents a particularly at-risk group due to existing health disparities, limited mobility, and systemic marginalization from health, social, and emergency response systems [5]. An analytical study on this issue, conducted by the United Nations (UN), identifies the disproportionate impact of climate change on this vulnerable population and human rights obligations of member States, emphasizing the need for disability-inclusive climate action [5].

Health consequences of climate change

Climate change poses significant and multifaceted threats to human health, both directly and indirectly [5, 7]. Direct health impacts include those resulting from temperature extremes (e.g., heat waves, cold spells), natural disasters (e.g., floods, hurricanes, droughts, wildfires), and environmental degradation. These can cause injuries, fatalities, and acute exacerbations of chronic conditions like cardiovascular and respiratory diseases [8]. These events are increasing in frequency and intensity due to rising global temperatures and shifting climatic patterns [1]. For instance, extreme heat is associated with dehydration, heat exhaustion, heat stroke, and cardiovascular strain, which can be fatal, especially among individuals with pre-existing medical conditions [8, 9]. Moreover, extreme weather events can lead to physical trauma, interruptions in healthcare delivery, and long-term disability, particularly when health systems are overwhelmed or infrastructure is damaged. Indirect effects are subtler but equally damaging, and include changes in vector ecology leading to infectious disease outbreaks, disruption of food systems causing malnutrition, reduced access to clean water and sanitation, and declines in air quality due to pollution, etc [10,11]. For example, higher temperatures and increased rainfall variability have expanded the geographical range of vector-borne diseases such as malaria, dengue, and Zika virus [12]. Waterborne diseases such as cholera and typhoid are more likely to spread in flood-prone or drought-stricken areas due to contamination or scarcity of clean water sources [10]. Concurrently, air pollution, exacerbated by wildfires and fossil fuel combustion, is linked to increased morbidity and mortality from respiratory and cardiovascular diseases. According to WHO estimates, ambient air pollution was responsible for approximately 4.2 million premature deaths in 2016, primarily due to stroke, ischemic heart disease, chronic obstructive pulmonary disease (COPD), and lung cancer [13]. These can significantly affect one's mental health, such as anxiety, depression, post-traumatic stress disorder, etc., either by direct trauma from extreme events, or by climate-related stressors, including displacement and loss of livelihood, stress of economic and social disruption [7, 14].

Populations with chronic conditions such as cardiovascular disease, diabetes, COPD, and neurological disorders like stroke or multiple sclerosis (MS) are especially sensitive to climate-related stressors. For example, individuals with MS are known to experience worsening of fatigue and motor dysfunction in hot conditions due to impaired thermoregulation and neural conduction [15]. Further, individuals with cardiovascular disease, respiratory illness (e.g., COPD), or neurological conditions such as stroke often experience worsening symptoms under heat stress or pollution exposure [13, 14]. These physiological responses can significantly reduce functional independence and quality of life. Moreover, mental health issues related to climate change, such as anxiety, depression, and post-traumatic stress, are increasingly recognized, particularly among those already experiencing social disadvantage [16].

Climate change amplifies existing health disparities and challenges health systems to deliver accessible, continuous, and responsive care to those most at risk [5]. The complex interplay between environmental stressors, health system disruptions, and social determinants of health requires integrated,



Source: Amatya B and Khan F[7]
PTSD indicates post-traumatic stress disorder; [a] Manifest uniquely in people with disabilities, [b] Floods, droughts, hurricanes, storms, wildfires, etc

Figure 1 **Potential climate change-related health impacts and vulnerabilities**

equitable, climate-smart healthcare systems [5, 7]. Figure 1 summarizes the potential impact of climate change on health, which interacts and overlaps depending on climatic variability.

Impact of climate change on PwD

PwD, accounting for 16% of the world's population (estimated at over 1.3 billion people), faces heightened risks from climate change due to systemic vulnerabilities and inequalities, reduced adaptive capacity, and limited access to health and social services [5, 17]. These make them especially susceptible to health and psychosocial impacts. According to the UN Human Rights Council, PwD face disproportionate risks of injury, disease, and death during climate-related events, and are often excluded from emergency preparedness and response [5]. A 2022 scoping review by Lindsay et al found that extreme weather events worsened pre-existing conditions among PwD, increased mental health burden, and heightened exposure to physical injury and trauma [18]. Furthermore, displaced PwD often faces prolonged separation from caregivers, difficulty accessing medication and rehabilitation, and deteriorating health.

Gaskin et al highlighted four key dimensions of vulnerability in PwD using the ICF framework: impairments in body function, activity limitations, environmental barriers, and personal disadvantages such as age, gender, and income [19]. Despite these challenges, climate policy and health system adaptation strategies often fail to include PwD in a meaningful way, signaling a critical policy gap [5]. Further, the Lancet report calls for urgent, intersectional action to break down systemic barriers faced by PwD worldwide [4].

Some of the potential intersecting vulnerabilities in PwD from the impact of climate change include (but are not limited to) [2, 5, 7, 17-21]:

Physiological vulnerabilities

Many PwD have underlying health conditions, including cardiopulmonary disease, reduced mobility, and impaired thermoregulation, that make them more susceptible to heat stress, respiratory complications, or infection.

Physical susceptibility

Many PwD have some form of limitation in mobility, sensory, or cognitive function that can restrict timely evacuation and emergency services access. Further, those who rely on assistive technologies (e.g., powered wheelchairs, ventilators) are particularly vulnerable during power outages or disruptions to essential services.

Barriers to healthcare access

During climate-related emergencies and other disasters, PwD often face difficulties in accessing medications, support and essential health services, including rehabilitation. A lack of disability-inclusive disaster planning frequently leaves them without appropriate evacuation, shelter, communication, or recovery services.

Socioeconomic disadvantage

Many PwD already encounter social and economic disadvantages, including poverty, unemployment, poor housing, and social exclusion, which increase climate vulnerability and reduce adaptive capacity. Further, these factors also limit their ability to recover from displacement, loss of assets, or disruption of social safety nets.

Disruption of support systems

Climate-related displacement, infrastructure collapse, or emergency responses may interrupt vital caregiving and assistive services, or community-based services, leaving individuals isolated and at risk.

Communication barriers

Individuals with sensory, cognitive, or intellectual disabilities may not receive accessible and timely information during emergencies, further hindering their ability to respond and seek help.

Understanding and addressing the unique needs of PwD is essential for building health systems that are resilient, equitable, and capable of protecting all members of society, especially in the face of climate change and other escalating disasters [5].

Role of PRM professionals

PRM professionals play a crucial role in addressing the functional, psychological, and social needs of people, including PwD [22]. They are uniquely positioned to address the intersection of disability and climate change, as their expertise spans from management of functional impairments, chronic conditions, and post-injury rehabilitation, to disability advocacy/education, areas that are highly sensitive to environmental stressors [7, 23]. As the climate crisis intensifies, their role becomes increasingly critical in managing the direct health impacts and advocating for inclusive, resilient health systems that support the most vulnerable population. The importance of integrating rehabilitation into all phases of emergency preparedness and response has been increasingly recognized by global health authorities [22]. PRM professionals play a critical role across this disaster care continuum and require a diverse skill set that spans diagnostic acumen, clinical management, education, systems coordination, and policy advocacy. Their involvement is particularly vital in the context of climate-related disasters, where the burden of injury, disability, and chronic health conditions is often compounded by disrupted services and infrastructure [24]. The complexity of these scenarios demands that PRM personnel be equipped to contribute effectively across all stages of the disaster management cycle, from preparedness and mitigation to response and recovery [22, 24]. Some of the key roles for PRM professionals in climate crisis management may include:

Clinical care and functional restoration

PRM specialists are trained to manage chronic disease complications, musculoskeletal injuries, neurodegenerative conditions, and functional impairments, which are either caused or worsened by climate-related factors. Their knowledge of how environmental factors impact function is essential in planning safe, individualized care plans that consider temperature, air quality, mobility, and fatigue. etc. Further, they can provide psychological support to help PwD manage stress, anxiety, and trauma related to climate events, displacement, or loss of social support.

Emergency and post-disaster rehabilitation

PRM teams have a crucial role in acute injury management (e.g., spinal cord injuries, traumatic brain injury, limb amputations, etc.), and in coordinating the care continuum, long-term post-disaster [22, 25]. They ensure that the victims receive timely interventions to prevent complications and facilitate successful community reintegration.

Enhance adaptive capacity and resilience

PRM teams can be key in the development of a structured system that improves the ability of PwD to adapt to and recover from climate catastrophes. This includes designing rehabilitation plans adapted to environmental constraints (e.g., safe exercise in heat-sensitive populations, dehydration, outdoor air quality), preparing individualized emergency preparedness plans, continuity of care for ongoing rehabilitation and medication needs, and collaborating across disciplines and systems to ensure accessibility and service continuity.

Education and advocacy

A growing number of PRM professionals recognize the importance of environmental health [23]. PRM professionals can lead in educating health workers, policymakers, and communities about the impact of climate change on disability and function, and the development of climate-resilient and sustainable healthcare systems. Further, their role is particularly

essential in educating patients and caregivers on managing health in extreme conditions.

Leadership in global health and policy

Organizations like the International Society of Physical and Rehabilitation Medicine (ISPRM) have taken steps to elevate PRM's role in disaster and climate-health initiatives. The ISPRM Position Statement on Climate Change and Disability advocates for inclusive governance, data-driven strategies, and partnership with PwD and civil society [24]. It calls for a multisectoral collaboration to ensure that rehabilitation is integrated into broader climate adaptation and health system planning, maximizing resources and impact. It calls all stakeholders for: raising awareness, strengthening health systems' adaptive capacity, involving PwD in planning and decision-making, and conducting research on climate-related functional impairments and rehabilitation outcomes [7, 24].

The way forward

There is a growing call from global agencies, including the UN, WHO, and disability rights organizations, to adopt disability-inclusive climate action that acknowledges and addresses the specific vulnerabilities and needs of PwD. However, disability inclusion is often absent from mainstream climate adaptation and mitigation policies. To address the escalating risks posed by climate change, the following strategic actions are needed:

Inclusive governance

Disability must be mainstreamed in climate and disaster policy frameworks, including Nationally Determined Contributions. National adaptation and mitigation strategies must explicitly recognize and incorporate the needs of PwD, ensuring accessibility of early warning systems, evacuation protocols, and disaster shelters. Further, PwD and their representative organizations need to be involved in designing policies and action plans.

Resilient rehabilitation systems

Investment in climate-proof infrastructure, mobile service delivery, and backup systems is essential. Rehabilitation services must evolve to meet climate challenges, which include the use of tele-rehabilitation, artificial intelligence technologies, mobile units, climate-informed infrastructure planning, etc. Services should remain functional and accessible during disruptions.

Workforce education

Training programs in medical schools and continuing education should include climate-related health risks, disability-inclusive planning, and sustainable healthcare. The healthcare workforce education programs should be focused on climate adaptation, sustainability, and rehabilitation planning. Interdisciplinary collaboration across public health, climate science, and disability sectors should be promoted.

Research and evidence

There is a paucity of data on how climate change affects functional outcomes, rehabilitation access, and long-term recovery. More studies are needed on the functional outcomes of climate-related illness and injury, rehabilitation accessibility during emergencies, and long-term community reintegration. There is a need for the development of climate-disability vulnerability indices to inform health planning and support participatory research involving PwD, especially from low-resource and climate-exposed regions.

Global partnerships

Multisectoral collaboration among UN agencies, governments, non-government organisations, academia, and disability-related organizations is vital to implement comprehensive, equity-focused responses. Global agencies such as the WHO, United Nations Development Programme, and ISPRM have an essential role in setting standards and mobilizing actions and advocacy.

Conclusion

Climate change poses a significant and growing threat to global health, with widespread consequences to vulnerable populations, including PwD. A structured, people-centered approach is essential for building climate-resilient rehabilitation systems to ensure that the unique needs of PwD are met, to reduce health disparities, safeguard rights, and empower individuals and communities. The road ahead requires coordinated, evidence-informed, and equity-driven action. As the climate crisis escalates, integrating rehabilitation into national and global climate health responses becomes not just relevant but essential. The time to act is now, for proactive, inclusive, and interdisciplinary collaboration to help build a safer, more inclusive, and sustainable future for all in this era of climate uncertainty.

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Concept and design, or design of the research; or the acquisition, analysis, or interpretation of data: BA, FK. *Drafting the manuscript or revising it critically for important intellectual content:* BA, FK. *Final approval of the version to be published:* BA, FK. *Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved:* BA, FK.

Conflict of interest

This article draws on the authors' previously published work: Amatya B, Khan F. Climate change and disability: A physical medicine and rehabilitation (PM&R) perspective. J Int Soc Phys Rehabil Med 2023;6:5–9. The views expressed are solely those of the authors. The authors declare no additional conflicts of interest.

Data availability statement

We confirm that the data supporting the findings of the study will be shared upon reasonable request.

Supplementary file

None

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