

Global Actions on Climate Change: The Health System Focus – A Systematic Review

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Keywords

Climatic change · Global action · Health system

Abstract

Introduction: It is now crystal clear that weather change is not just a fact but a circumstance that threatens to be extremely destructive. It has a quantifiable negative impact on human well-being, physical and mental health. Therefore, this review was conducted with an aim to study the global actions on climatic changes with a special focus on health of the population, health systems, and their preparedness.

Methods: The writing of this systematic review followed the guidance of PRISMA checklist. Extensive literature research was conducted at the sources of information which included MEDLINE (PubMed interface), and Google Scholar, to identify articles discussing the role of climatic change and its impacts.

Results: It was found that many challenges to health sector are posed by the climatic changes; therefore, public health preparedness and response should be upgraded through strategy adaptation, risk mitigation, and assessment measures. **Conclusion:** Discoveries on key health changes and climatic indicators aimed toward informed decisions by policy makers about policy programs implementation, detect evidence gaps, and better recognition of the barriers in

achieving the health system adaptability and resilience, thereby maximizing the health problems caused by climate change around the globe.

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Introduction

Climate change is a growing problem around the globe. It leads to various dangerous hazards, including storms, floods, and wildfires, which slowly and gradually lead toward the changes in the ecosystem, food and water security issues, and loss of a residence and culture [1].

Climate change is one of those few natural threats that occurs due to human activities, including deforestation, depletion of ecosystem, biodiversity, and economies loss. These noncompliances depend on the fossil fuels, which lead toward shortage of food and water and, air, land and water pollution [2].

Between 2007 and 2016, weather disasters increased by 46% above the average of 210 in the year 1990–1999 [3]. The lives of millions of people all over the world is seriously affected by the climatic change [4, 5]. In 2018

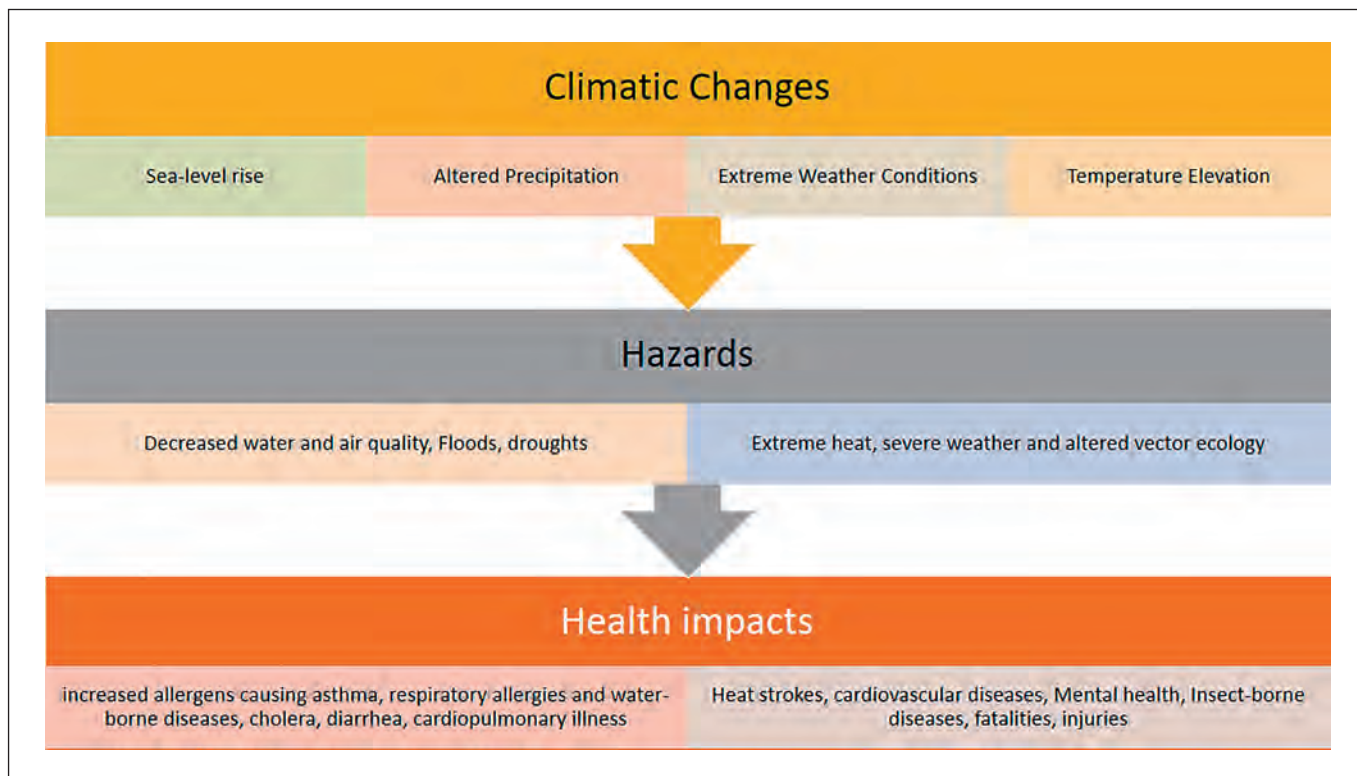


Fig. 1. Climatic change pattern, its hazards, and its health implications.

and early 2019, earthquakes, floods, droughts, severe weather, and hurricanes have caused destruction on many regions [6].

As climate change is affecting large number of people day by day, many harmful environmental and social causes influenced psychological problems and worsened mental health, thus initiating emotional stress, and also newly developed mental health conditions. It is becoming increasingly clear that the weather change has a quantifiable negative impact on human well-being, physical and mental health and health sector could play an important role to help countries in adapting these challenges [7].

Climate change is one of the main causes of health problems of twenty first century [8]. If global warming perseveres, it would lead to intensified heat waves and therefore overheating weather conditions, causing floods and droughts in different areas [9, 10]. However, it has been noticed that majority of the times global warming was caused by human activities, including burning of fossil fuels, deforestation, transportation use, emission of gases in power generation, and production of goods, which in turn affects the human health on larger aspect [11].

There is also evidence of connection between climates and infectious diseases, including animal-borne diseases, caused by food and water, tick-borne encephalitis, West Nile virus, breathing problems, and heat-related discomfort [12, 13]. Collectively, climate change can also possibly cause problems like violence issues, mass migration of people, and psychological problems [14]. Some climatic change pattern, its hazards, and its health implications are shown in Figure 1.

Moreover, climate changes disrupt the continuity of health care delivery affecting the health of people and especially noncommunicable diseases. It has been noted through different researches that climatic disasters including storms, cyclones, and floods do exacerbate the health and disease condition of many people suffering from cardiovascular diseases, cancer, and diabetes. This is caused by many disrupting factors including lack of transport, weakened drug supply chains, evacuation of concerned people, and also loss of power [15].

Further, increased heat waves and global warming is actually posing risk to the health of people suffering from cardiovascular, renal, and respiratory problems in terms of hospital admission, emergency presentations, and also

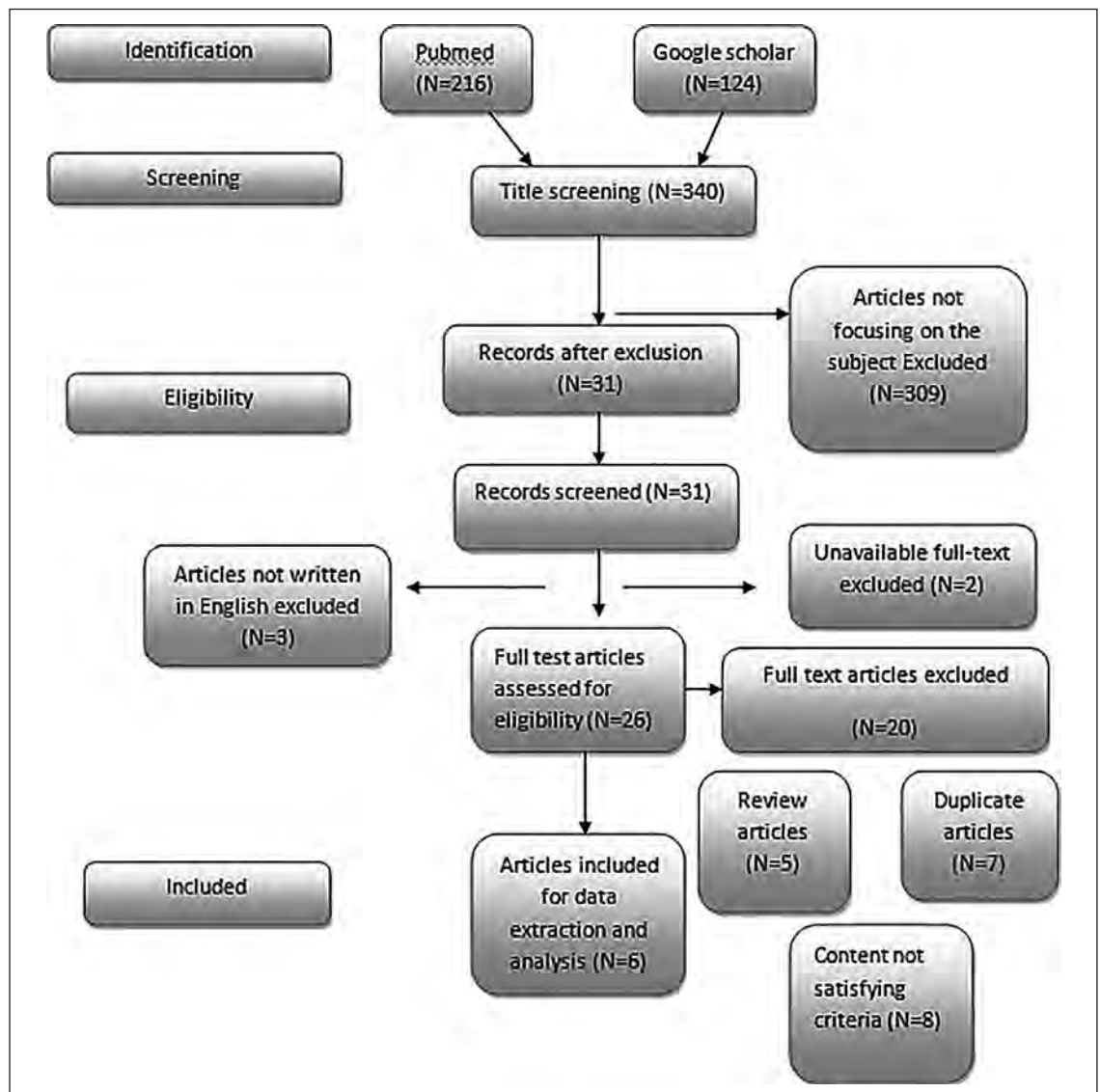


Fig. 2. Summary of the systematic review followed the guidance of the PRISMA checklist.

increased mortality [16]. Hot weathers might also cause sleep disturbances and are also cause of physical inactivity which in turn are the risk factors for cardiovascular diseases [17–20]. Furthermore, rising sea levels are increasing the salinity in the groundwater, which leads to increased salt intake of the affected population causing increased blood pressure [21].

Climatic change has become a major driver of disaster losses and barriers to developmental success. At the same time, other risk factors such as poverty, demographic development, land degradation or conflicts increase exposure to weather-related risks. Therefore, risk assessment and management in the context of climate change

requires a holistic, systematic approach, a view of danger and its underlying causes due to the complex nature and part of the climate-related risk system [22]. Therefore, health system should be prepared to respond to these evolving emergencies, to fulfill the growing need for Mental Health and Psychosocial Support (MHPSS) [1, 2].

It was found that many challenges to health sector are posed by the climatic changes; therefore, public health preparedness and response should be upgraded through strategy adaptation, risk mitigation, and assessment measures. Therefore, measures should be taken to global health security which could have devastating effects due to climatic changes [23]. Therefore, this review was conducted

Table 1. Following articles were included in the study as per the inclusion criteria

Author	Year of publication	Cohort	Type of study	Finding
Watts et al. [3, 4]	2018	Lancet Institute for Global Health Commission	Systematic review and meta-analysis of prospective studies	Outlines health and climate change; case studies of different countries highlighting their trends and initiatives; and several goal commitments for adaptation
World Health Organization [8]	2021	PMNCH, WHO	Executive summary	Increase the awareness, knowledge, and capacity of young generation and different organizations to act against climate change and its impacts on health and well-being
Costello et al. [9]	2009	Lancet and University College London Institute for Global Health Commission	Executive summary	Climate change is the main health hazard of the 21st century worldwide and recommended that a new public health initiative would upsurge advocacy to decrease climate change
Watts et al. [10]	2015	Academic centers in Europe and China	Executive summary of 2015 Lancet Commission	Climate change impact and the policy responses necessary to ensure the health for worldwide populations
Khader et al. [13]	2015	EMR	Systematic review	Data showing the association of climate change and health is scarce in the most vulnerable countries of the region
Elsevier Health Sciences [14]	2016	-	Executive summary	The adversarial health effects of climate change will be extensive and will excise public health assets worldwide

EMR, Eastern Mediterranean region; PMNCH, Partnership for Maternal, Newborn & Child Health.

with an aim to study the global actions on climatic changes with a special focus on health of the population, health systems, and their preparedness.

Methods

The writing of this systematic review followed the guidelines of the PRISMA checklist [24]. Three reviewers were involved in the process of data collection to reduce the risk of biasness. Extensive literature research was conducted at the following sources of information, which includes MEDLINE (PubMed interface) and Google Scholar to identify articles discussing the role of climatic changes and its impacts. The following keywords were used independently and in combination including climatic change, global actions, health system, extreme weather episodes, global warming, climate change, and its negative impacts on the environment and human in the search process. These keywords were used in a variety of combinations to find all the articles that can be made on a topic of interest. All subjects found in this primary trial were reviewed, and all subjects who did not focus on the combination of keywords were excluded.

The inclusion criteria were set to include articles in the current review; thus, articles published after 2010, focused on the current topic, general climatic conditions were focused. Further, only English articles and full-text articles were described as complementary

articles in additional steps. The second step involved checking the summaries to select the appropriate subjects for review. Duplicate articles, unavailable full-text articles, subjects with incomplete or partial data, and articles that does not focus on the main topic were excluded. The risk of biases was reduced by increasing the number of reviewers and excluding the duplicate and unavailable full-text articles. Further, PRISMA checklist was strictly followed. Summary of the systematic review followed by the guidance of PRISMA checklist is shown in Figure 2.

Results

Total 6 articles were included in the study for data extraction and analysis. The details of these articles are mentioned in Table 1.

Discussion

Climate change is one of those few natural threats that occurs as a result of human activities, including deforestation, depletion of ecosystem, biodiversity, and economies

loss. These noncompliances depend on the fossil fuels, which lead toward shortage of food and water and, air, land and water pollution [2].

As climate change is affecting large number of people day by day, many harmful environmental and social causes influenced psychological problems and worsened mental health. It is becoming increasingly clear that the weather change has a quantifiable negative impact on human well-being, physical and mental health and health sector could play an important role to help countries in adapting these challenges [7].

Global Efforts and Actions for Climate Change

In the last 5 decades, incidents related to climatic changes have been increased, with 50% affecting approximately 5 billion people [25]. Climatic changes are posing serious negative effects on the health of people, which can both directly and indirectly affect their mental and physical health. The World Health Organization (WHO) recommended five key approaches to address these negative impacts caused by the climatic changes including (1) integrate considerations related to climatic effects into policies and programs, including MHPSS, for better preparedness and response in a climate crisis, (2) integrate MHPSS between climate policies and programs, (3) build on international obligations, (4) implement multi-sectoral and community-based approaches to mitigation weaknesses and address mental health as well as social impacts of climate change, and (5) address the huge gaps in funding for both mental health and response to the health impacts of climate change [26].

Further, recommendations are also given in the 26th UN Climate Change Conference (COP26) special report regarding the climate change and its impact on health. A set of important instructions have been given, from global health point of view, including civil society and government policy makers, thereby emphasizing to act with urgency on climate and current health problems. COP26 recommendations are developed on the basis of United Nations Framework Convention on Climate Change (UNFCCC) and aimed toward various opportunities that would prioritize governments' global health agenda of equity in climate change and sustainable development [27].

Climatic changes must therefore be directed toward the protection of global health security. The implementation of International Health Regulations (2005) [28] and the Sendai framework to reduce disasters [29] could also be proved as a milestone in providing some protection from climate change and its natural effect. Therefore, in

an effort to speed up implementation regarding the impact of climatic change and health framework for the action on Eastern Mediterranean region, the following important points were suggested to countries including (1) multi-sectoral coordination to improve the role of the health care sector as well as embracing ways to protect the decisions of environmental health. (2) Climate risk assessment: map of potential weather hazards should be checked considering all the risks, with several tools [30]. Prepare a public health program with responses to natural disasters as well as integrate it into national public health readiness and response system as well as a national disaster risk reduction plan. Design conditions and perform experimental tests capacity readiness in the country to test system performance. (3) Early detection: improve observation, including entomological observation, with original function signal acquisition, and use it for human and environmental disease prediction. Ensure access to diagnostic laboratory equipment to quickly detect germs. (4) Feedback on the emergency care plan. Check health care facilities and prepare plans for capacity building, including infrastructure, medicines, vaccines, and supplies to manage logistics and assets along with the availability of qualified staff. (5) Risk communication plan in collaboration with all sectors, providing communication training and promoting awareness of climate change, to ensure their involvement in managing climate-related events. (6) Map partners and donors to raise resources to build national resilience to climate change resilience by establishing collaborative programs for data forecasting, modeling, and research to better understand climate change and promote scientific decisions.

Global Success Stories and Initiatives Taken by Different Countries to Reduce the Devastating Effects of Climatic Change

The managing strategies regarding the climatic changes do have profound effect related to mutual benefits and environmental health. For instance, it has been reported that 369,000 premature deaths have been reported in Europe as per the records of European Health Commission. As per the Environmental Protection Agency (EPA)-based statistics data of the USA, health care facilities also produce sulfur dioxide, carbon dioxide, mercury, and nitrogen oxide into the environment causing devastating health effect among the general population which leads to asthma, cardiovascular diseases, and also respiratory diseases [31, 32]. By reducing the emission of these by-products, health care facilities can contribute in improving the general health and physical and mental well-being of people.

Furthermore, it is also reported by the international non-governmental organizations in collaboration with World Wide Fund for Nature (WWF) and Health and Environment Alliance that if the greenhouse gas (GHG) emission would reduce by 30% in 2020, it could definitely benefit the health outcomes of general population, for instance, less than 105,000 would lose their lives; there would be less than 2,700 cases of hospital admission and less than 5,300 chronic bronchitis cases in the world [33].

Moreover, an energy impact calculator was created in the USA by the Practice Green health organization. This calculator is used to measure the health effects caused by the fossil fuel-based energy consumption, which include chronic bronchitis, emergency department visits, asthma attacks, and premature deaths. As per the peer research, it was found that energy impact calculator was used to calculate external costs to the community, medical expenses estimation, permit cost for GHG emission, and many more [34].

To cope up with the effects of the climatic changes, health care facilities should expand their strength of disaster preparedness and management by creating synergies through climate reduction. For instance, all the human activities which are actually causing the devastating climate changes could be reduced. This can also be done by strengthening the capacity of the health sector, so it could work at worst weather events expected to be brought about by climate change. This would lead to the provision of increased primary care access in developed countries in the world, empowerment of local clinics and hospitals, and also the creation of sustainable, reliable, and affordable system to meet the basic health needs of the people. For instance, Solar Electric Light Fund (SELF) has been installed in the rural clinics in Masasi region of Tanzania for the provision of vaccine refrigeration, electrical computer supply, and lightning in absence of electricity.

Thus, in many lands, emphasis is placed on basic health care, which significantly reduces the need for resources. Once the focus is more on preventive measures rather than the treatment strategies, climate track record of the health sector would also be reduced [35].

Climate Change Efforts in the Arab's Countries (Focus on Health System)

Climate change in the Arab world could seriously affect access to health care services and quality of health among the people. The points evident to the causes of climate change involve both natural factors and human behavior. The sequence of climate already has a negative impact on the economy of several Arab countries, regarding

food safety and security and also the social and health status of many people [36, 37].

Further, stressors such as population growth, unequal access to resources, and lack of food, poor health systems, and poverty would definitely also decrease the quality of life of many people in the Arab world. Further, decreased science and technology capacity also hinder the climatic change risk preparedness and adaptation [36].

For instance, Lebanon's climate is very high, with hot, dry summers and cool winters [38]. Due to the dry deserted conditions, water resources are scarce and rain patterns are vulnerable [39], which ultimately threatens the agricultural sector [40]. In addition, climate change is also expected to cause landslides, droughts, sea level rise, and forest fires which could lead to health risks such as infectious diseases, increased morbidity, and death [38]. In addition, storm surges can increase damage to lower infrastructure and communities. Therefore, Lebanon's Nationally Determined Contribution (NDC) registry outlines a number of adaptation strategies, including implementation of climate change plans to ensure and protect public health, welfare, and safety of all Lebanese communities [39]. Indeed, this includes assessing the health risks to climate change, establishing early warning systems, and capturing climate information for national health information [39].

On the other hand, Iraq's climate varies between the rising temperatures and changes in rain patterns which led to a recurrence drought, desertification, and the sandstorms [40–44]. Such climate change poses serious health risks, including heat stress, foodborne illness, waterborne diseases, respiratory diseases, and malnutrition [41]. Iraq's Nationally Determined Contribution (NDC) registry incorporates health practices such as the initiation of disease monitoring as well as control systems, including the provision of drinking water and the monitoring of communicable diseases [45].

The case of Egypt clearly shows effects of climate change including temperature, rainfall, and sea level rise. Egypt also has certain challenges of overcrowding, water scarcity, and small areas of fertile and usable land. Integration of climate change in all planning strategies and development steps are the main importance of the country. Therefore, Egyptian government has started National Climate Change Strategy to initiate green finance marketing for clean transportation and water management [36].

Similarly, Saudi Arabia has started Saudi Green Initiative (SGI) to combat the climatic crisis of the country. It aims to improve the quality of life of people by protecting at least 30% of the global oceans, by contributing to UN

sports for climate action initiative, and by cutting global methane emission by 30%. SGI brings three overarching targets together including environmental protection by reduced emission, protection of land and sea through sustainability programs, and also energy transformation [46].

United Arab Emirates on the other hand has planned a comprehensive framework to fight against the devastating climatic changes so that resilient green economy along with the better quality of life could be achieved. The comprehensive framework of UAE includes following plans: (1) GHG emission management system; (2) adaptation strategies for climatic changes; and (3) economic diversification programs for private sectors [47].

Moreover, Qatar's national environment and climate change strategy includes following priority areas including water security, GHG emission and air quality, biodiversity, circular economy, and waste management [48]. In line, Oman also plans for mitigation strategies for GHG emission control prioritizing and financing the energy demands and supply as per the economic growth and cost-effective strategies for efficiencies [49]. Meanwhile, Tunisia also plans for carbon intensity reduction and stability of GHG emission. Further, Tunisian solar plan, waste water management, agriculture, land use, and forestry plans were also initiated [50].

From Knowing to Doing: Recommendations for Health System Resilience and Readiness

Climatic changes are posing serious negative effects on the health care system and other health facilities, which eventually decrease the capabilities of health care workers to protect people from a variety of health hazards related to climatic changes. On the other hand, health care facilities can themselves be the part of climatic change as they produce large quantities of wastes and environmental pollution including GHGs and other contaminants, radioactive materials that could be released in environment and transmitted to people thereby posing a threat to the health of individuals and communities [51].

Further, these health care facilities might also lack functional infrastructure and trained health workers, and are at risk of inadequate electricity, water supply, sanitation, and waste management services, which is again a major reason of health problems in people [52]. Development of these health care-related priorities is the key to build resilience and contribute toward sustainability of the environment. Thus, this is important to provide the guidance to improve the capacity of health care facilities to ensure their safety and well-being in a volatile and changing climate and to make life easier to sustain the

environment, by improving resource utilization and mitigation of waste disposal in the environment. The guidance is based on the WHO Working Framework building climate-resilient health systems (WHO Framework). This framework is weatherproof and environment friendly; it provides sustainable health care facilities, which contribute toward quality care and access to health care services, and thereby it helps to reduce the capital cost and in better procurement [53]. This WHO framework develop awareness related to four key requirements that are important for providing safe and quality health care in relation to climatic changes [54]. These four components include (1) adequate numbers of skilled, respectful, empowered, and knowledgeable health care workers to deal with the climatic challenges; (2) to work on the sustainable and safe water management, sanitation, and health care waste disposal services; (3) to make use of sustainable energy resources; (4) to provide relevant infrastructure, technology, products, and procedures, which include all activities that allow for better health outcomes for a place of care. This framework provides suggestions and recommendations for the implementation of interventions aimed at strengthening climate resilience as well as environmental sustainability; provides the proposed interventions, organized around the four broad areas of the frame [55].

Furthermore, Middle East and North Africa climatic week (MENACW) recommended to build strong mechanisms for the reporting of GHG emissions in the countries, further progress on noncommunicable diseases and their adaptation plans. It was also recommended that all countries should follow the enhanced transparency framework to produce transparent and reliable comprehensive information about the climatic actions [56]. Moreover, United Nation Office for Disaster Risk Reduction (UNDRR) also gave some recommendations including (1) encouragement of political leadership and dynamism; (2) promote comprehensive disaster and climate control; (3) to empower and unite communities to ensure that no one is left behind; (4) invest to attain sustainability and resilience in infrastructure and programs; (5) promoting new methods for investments and funding; and (6) ensure use of effective measures in science and technology, evidence, and communication to promote behavioral change [57].

Conclusion

All countries around the globe require an awareness raising program and an effective response about the health risks posed by the climatic changes. The effects of

climate change are really injurious to human health and well-being and it also promotes social and health inequality. The World Health Organization (WHO) declares the World Health Report in year 2021 on health and climate change which provides an important summary of overall progress done by the governments of different countries to address the health risks related to climatic changes. Discoveries on key health changes and climatic indicators aimed toward informed decisions by policy makers about policy programs implementation, detect evidence gaps, and better recognition of the barriers in achieving the health system adaptability and resilience, thereby maximizing the health issues related to climate change around the globe.

Statement of Ethics

An ethics statement is not applicable because this study is based exclusively on published literature.

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Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

This study has a sole author who has designed the study, analyzed the data, prepared the manuscript, and also approved the final manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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