



Knowledge and Perceptions of Healthcare Educators Regarding Climate Change and its Inclusion in Undergraduate Health Sciences Curriculum

Ms. Saira Mehboob Ali Lalani¹ Dr. Javeria Farooq² Ms. Samreen Nanji³ Ms. Razia Jaffery⁴

¹ Instructor, Aga Khan University School of Nursing and Midwifery, Karachi, Pakistan.

² Associate Professor, Iqra University North Campus, Karachi, Pakistan.

Email: javeria.farooq09@gmail.com

³ Lecturer, Iqra University North Campus, Karachi, Pakistan.

Email: samreen.nanji@iqra.edu.pk

⁴ Lecturer, Iqra University North Campus, Karachi, Pakistan.

Email: razia.jaffery@iqra.edu.pk

Corresponding Author: saira.lalani@aku.edu

Vol. 4, Issue 1, 2025

Article Information

Received:

2025-03-30

Revised:

2025-05-22

Accepted:

2025-06-21

ABSTRACT

The study explored the knowledge and perceptions of Health Care Educators regarding climate change and its inclusion in undergraduate health sciences curriculum. The study data was collected with 12 individualized interviews of faculty members. The written consent was taken from all the participants. The duration of each interview was 30 to 40 minutes. They were conducted in English language and were audio recorded for transcription and analysis. Key findings affirmed that climate change, driven predominantly by human activity, incurs broad-ranging impacts on public health, necessitating an informed response from healthcare educators. There is a consensus on the urgency to integrate climate education into health curriculum at both undergraduate and postgraduate levels, equipping future healthcare providers to navigate the complexities of climate-related health challenges. Schools can play a vital role in disseminating health education related to climate change. The integration of climate-focused content promises to foster awareness and drive behavioral changes to mitigate the deleterious effects of climate change on health and society. Early education is the foundation for addressing health disparities arising from climate-related issues, ensuring a resilient future generation.

Keywords: *Climate Change; Health Education, Health care Educators, Curriculum and Population.*

Citation: APA

Lalani, S, M, A., Farooq, J., Nanji, S & Jaffery, R. (2025). Knowledge and perceptions of healthcare educators regarding climate change and its inclusion in undergraduate health sciences curriculum, *Journal of Climate and Community Development*, 4(1), 347-356.



Introduction

Climate change is documented as a global health threat. It leads to variations in temperature, severe weather alterations, air contamination, intensifying storms and droughts, acidifying oceans and interference with ecosystems that have direct and indirect impact on human well-being. With damaging effect on environment, the economic consequences of climate change cannot be disregarded effecting the livelihood of people around the world (He & Silliman, 2019) (Rising et al., 2022).

Moreover, climate variation has an impact profoundly on public health including temperature-linked illnesses and injuries from extreme weather like floods and wildfires. It also enlarges the risk of vector-borne diseases and water-borne illnesses due to altered environmental situations (Ebi et al., 2021). This illness also effects fertility of male and female, the developing fetus, and obstetric outcomes (Segal & Giudice, 2022). Furthermore, climate alteration causes food and water scarcity, leading to malnutrition and straining mental health due to displacement and anxiety. The climate events like rising temperatures and poor air quality also effect mental health (Clayton, 2021). These impacts excessively affect vulnerable populations, emphasizing climate alterations as perilous public health issues.

The increase in climate related diseases and illnesses are burdening the health care system. It is vital that the focus should be on the mutual working of disaster management with adaptations to climate changes events to develop resilience and minimize the risk toward health and well-being of the population (Banwell et al., 2018). Health care system and health practitioners like physicians, nurses, and pharmacists should have a better understanding of the complex relationship between climate change and health, from the development of infectious diseases to changes in air quality, extreme weather events, and food poverty (Babar et al., 2021). Health institution and health practitioners plays a vital role in modelling environmental policy, education, and public health programs to mitigate with climate variation health impacts (Nikendei et al., 2020).

To develop these long terms, plan for facing the

challenges, it is essential to educate and aware the health practitioners. For this purpose, inclusion of climate change education in the curriculum of undergraduate health sciences programs has been discussed due to the connection between health and climate change. The effects of climate change are diverse in different parts of the world, and it is an international phenomenon that crosses national boundaries. By including a global health viewpoint into the curriculum, educators may help students grasp the wider effects that climate change is having on people all over the world, leading to a more thorough comprehension of the problems and potential solutions. Inclusion of climate subjects in science and health studies prepares students with adaptation and vindication of knowledge, skills, and attitudes (Létourneau et al., 2023).

The study aims to explore the Knowledge and perceptions of Health Care Educators regarding climate change and its inclusion in undergraduate health sciences curriculum

Research Question

1. Please share your perceptions about climate change.
2. Please share your perspectives about why it is necessary to educate the population regarding climate change.
3. Please share the strategies that can be used on short- and long-term basis to educate the population regarding climate change.
4. Please share the importance of including climate change in the healthcare curriculum.

Research Methodology

Sample Size and Sampling Method

An exploratory qualitative research method was used to explore the knowledge and perceptions of healthcare educators regarding climate change and its inclusion in the undergraduate health sciences curriculum. According to the goal of the study, a non-randomized purposive sampling strategy was used. A total of 12 educators from diverse healthcare professional backgrounds—such as doctor, nurse, pharmacist, and biochemist were included. Only those participants who met the inclusion criteria were selected.

Data Collection Process

An individualized interview was used for data

collection. Participation in the interview was voluntary, and written informed consent was obtained from each participant. In total, 12 interviews were conducted. The duration of each interview was between 30 minutes to 40 minutes. These interviews were conducted in English language as all the participants were faculty members. The data was audio recorded. The researcher took field notes about the nonverbal gestures of the participants. Additionally, the researcher documented personal reflections after discussion to minimize bias.

To achieve content validity, the interview guide was pilot tested with 2 of the participants, who are not part of the actual study sample. No changes were required in the interview guide after pilot testing, as it was understandable and relevant to the study topic.

Data Entry and Analysis Process

Data analysis was done physically (without using any software) at the same time along with the data collection. Interviews were transcribed, and these transcripts were analyzed following the steps given in the content analysis suggested by Creswell (Creswell, 2018).

Ethical Approval:

Ethical approval for the research study was approved by the Iqra University Ethics Review Committee (IU/FHS/ERC/24-017).

Results

The researchers analyzed the data and extracted four themes. These are health professional insights regarding climate variations, health consequences of climate instability and ecological decline, and environmental conservation approaches: addressing immediate and future needs and preparing healthcare professionals for climate-related challenges.

The first theme emerged from two categories, which are climatic shifts and human-driven environmental stressors. The second theme contains three categories, which are climate-induced health concerns, climate vulnerabilities, and environmental degradation. The third theme has three categories, which are: climate change advocacy, green measures from diverse sectors and behavioral change initiatives. The fourth theme has emerged from two categories, which

are: educational reforms and preparedness for environmental crisis.

Theme 1: Health Professional Insights Regarding Climate Variations

This theme reflects the healthcare educator's perspective on climate change as a global issue and outlines the factors contributing to this ecological shift. This theme emerged from two categories: climatic shifts and human-driven environmental stressors.

Category 1: Climatic Shifts

This category provides the description of global climatic alterations and extreme temperature shifts throughout the world. Many of the participants mentioned that climate change has global occurrences. The seasons around the world are different than before. The situation is getting extreme day by day. One of the participants stated that, "Climate change is a global phenomenon, but its impacts are felt differently depending on geographical location" (IDI-01).

Another participant stated that: "Climate change is getting extreme, whether extreme summer or extreme winter. Extreme changes in the climate are not normal, which really affects our daily routine" (IDI-06). One of the other participants stated that: "Climate change is a tenacious global issue with far-reaching values for public health" (IDI-09). This category emphasizes changes in the global climate and the escalating temperature changes affecting population health.

Category 2: Human-Driven Environmental Stressors

This category highlights the human activity that's leading to environmental changes globally. The primary driver of this alteration involves deforestation, burning of fossil fuels, cutting of agricultural land etc.

One of the participants expressed that: "I think the primary causes of climate change, are burning fossils fuels, deforestation, cutting of the trees and industrial waste" (IDI-02). Another participant added that:

The two main reasons behind this alteration are population and pollution. The increase in population, the increase in usage of fuel, increase in usage of land and every other resource. The other one is pollution. That is again a gift of the

increased population that is increasing day by day. (IDI-04)

One of the other participants stated that: “The major reason is the destruction of the natural habitat or the ecosystem that leads to disturbance of the natural rhythm of the universe causing intense climate change” (IDI-06). These are some of the major causes of drastic climatic alterations causing distress to living beings, especially to humans.

Theme 2: The Health Consequences of Climate Instability and Ecological Decline

This theme describes the healthcare educator's perspective on health concerns and ecological issues that are emerging as an outcome of climate change. This theme emerged from three categories: climate-induced health concerns, climate vulnerabilities and environmental degradation.

Category 1: Climate-Induced Health Concerns

This category covers the climatic repercussions on physical health causing numerous health problems that may include heat stroke, vector borne diseases (malaria dengue), respiratory problems (allergens), skin diseases, kidney disorder, diarrhea and mental health issues etc. Its effect on Pediatric population including their growth and development. It also highlights the issue of poor access to healthcare facilities. One of the participants stated that:

Climate change causes various health hazards, including heat-related illnesses, respiratory problems due to poor air quality, and the spread of vector-borne diseases like malaria and dengue. It also causes food and water security issues, potentially leading to malnutrition and waterborne diseases. (IDI-12)

Another participant indicated that: “Due to climate changes people have difficulty in accessing healthcare facilities” (IDI-02). This participant further emphasized the effect of climate alterations on pediatric populations and stated that:

I think the play of children is also affected by temperature changes as in our ages we used to have outdoor play but now a day due to the high temperature, we cannot send our children

outdoors to play. Due to which their psychomotor skills and mental wellbeing are getting affected. (IDI-02)

Category 2: Climate Vulnerabilities

This category highlights the resource scarcity and economic instability resulting from climate variations across the globe. It further explores challenges such as food shortages, premature degradation, harm to marine life, damage to infrastructure (including housing), soil infertility, impacts on GDP and tourism, greater dependence on energy resources like electricity, and difficulties in achieving sustainability.

One of the participants highlighted that: “Climate has made our populations vulnerable particularly those in developing countries. They are extremely affected by its consequences, such as food and water insecurity and health risks” (IDI-11). Another participant expressed their thoughts as: “It exacerbates food and water security issues, potentially leading to malnutrition and waterborne diseases” (IDI-12). One of the other participants highlighted that: “The loss of soil fertility has affected the country's GDP, forcing many individuals to live hand-to-mouth as they depended solely on their crops for their livelihood” (IDI-02).

Category 3: Environmental Degradation

Climatic alteration has ruined our environment and has affected the natural resources to a drastic level. It includes melting of the glaciers, floods, land sliding, deforestation, unpredictable and heavy rains, scarcity of natural resources (water) etc.

One of the participants described that: “Rise in temperature leads to precipitation that changes rain fall pattern, cause ocean acidification destroying marine life” (IDI-04). Other participants highlighted that:

If we look at our own country in the past few years, we have encountered many floods and heavy rainfalls. Because of these we have faced a lot of challenges. Particularly those people are suffering who belong to minorities or who are underprivileged in terms of the economy. They lost their houses, got deprived of food, water and healthcare facilities as well. (IDI-01)

Theme 3: Environmental Conserving Approach: Addressing Immediate and Future Needs

This theme covers the strategies that can be used to aware the population regarding climate change and the ways to conserve the environment. This includes advocacy regarding climatic variations, eco-friendly measures by different stakeholders and community engagement initiatives. This theme includes three categories that are: climate change advocacy, green measures from diverse sectors and behavioral change initiatives.

Category 1: Climate Change Advocacy

This category explores strategies for advancing climate change advocacy, including the use of media platforms, educational programs, and promotional initiatives aimed at raising public awareness about protecting our climate. One of the participants said: “To aware the population, climate change education should be integrated with the basic level of education” (IDI-03).

One of the other participants expressed their thoughts as:

We can spread the word through digital and social media, arranging seminars and events to spread awareness in the community. It should not be spread only among a particular group or class, it should be provided to all, including common people, as this problem is way bigger and affecting everyone around us. (IDI-05)

Category 2: Green Measures from Diverse Sectors

This category covers eco-friendly measures by stakeholders including government officials, policy makers, NGOs, religious leader or community leader, public and private institutes to raise awareness and take initiatives, that can encourage people to follow environment sustainable practices.

One of the participants highlighted that: “Social, political and religious leaders should advocate for strong climate related policies and regulations at local, national, and international levels to create a framework for addressing climate change and transitioning to a low-carbon economy” (IDI-08). Another participant said that: Religious leader or community leader, can make the community aware and reinforce them to follow healthy

practices that can save environment. They can do it on a regular basis during their community and religious gatherings” (IDI-03).

Category 3: Behavioral Change Initiatives

Community-led sustainable initiatives can play a key role in encouraging environmentally friendly behaviors in the public. These initiatives can focus on promoting practices such as adopting carbon-free, plastic-free, and paper-free lifestyles; reducing energy consumption; conserving water; utilizing public transportation or walking; recycling; supporting renewable energy sources; and engaging in tree-planting activities.

One of the participants highlighted that: “Environment be saved from further harm by making more sustainable choices in daily lives, by supporting initiatives that aim to reduce carbon emissions, and spreading awareness about the urgency of the issue. Ultimately, tackling this is not just about protecting the environment; it’s about ensuring a livable planet for future generations. (IDI-10)

Another participant stated that: “Some activities can be arranged like guiding people about recycling of different things and telling them about what difference they are making through this to their environment” (IDI-04).

Theme 4: Preparing Healthcare Professionals for Climate-Related Challenges

This theme highlights the significance of preparing healthcare providers with the knowledge and skills to address climate-driven health issues. It involves recognizing the impacts of climatic alterations on public health. By integrating climate change into healthcare curriculum, professionals can better predict, mitigate, and respond to evolving health risks.

Category 1: Educational Reforms

This category emphasizes on educational approach that can be the best option for preparing the healthcare providers for climate related uncertainties. They can be equipped by adding climate education as a core course in their curriculum on basic and advance levels so they may have the understanding of climate changes and its effects on health.

One of the participants highlighted that: “Another method is to add climate health education in

healthcare curricula. This would ensure that future healthcare providers are prepared to discuss these issues with people from the beginning of their careers” (IDI-07). One of the other participants explained that:

Ensure that all medical professionals have a basic understanding of the relationship between health and climate change. Topics including the effects of climate change on human health, risk assessment and management connected to climate change, and methods for advancing climate-resilient healthcare systems could be included in this course. (IDI-01)

Category 2: Preparedness for Environmental Crisis

This category discusses about preparing skilled healthcare providers to promote community resilience and deal with environmental emergencies including disasters. Their knowledge and skills should be polished to deal with climate driven emergencies. One of the participants stated that: “To deal with climate-related health emergencies, healthcare providers must be aware of its implications on health. Moreover, they play critical role in responding to the health effects of climate change-related events such as heat waves” (IDI-09).

Discussion

With increasing and apparent adverse effects of climate change around the world it is high time that awareness and understanding regarding climate change should be heightened. The study finding revolves around the understanding and perception of climate change by health care educators. The finding concluded that health care professional possesses a comprehensive knowledge of climate change. They all established that climate change is evident by extreme temperatures and nearly all the core reasons leading to climate shifts are human induced and had a wide impact on human health and daily life. The study findings aligned with the surveys conducted by Kotcher et al. (Kotcher et al., 2021) and Sarfaty et al. (Sarfaty et al., 2016) affirming the knowledge of health professional and stated that the leading cause of climate change included pollution, industrialization, deforestation and burning of fuels and fossils. The study finding suggested that that the climate shift is leading to heat waves, wild fires, drought, floods, and

environmental degradation. The findings are similar to other research studies confirming the deteriorating impact of climate change on nature (Di Napoli et al., 2022) (Ahmed et al., 2018). The current study results stated that climate change had led to devastating effect on physical and mental health. Due to temperatures changes and environmental changes, there is increase in water and vector born disease and soil degradation effecting on quality of food resources leading gastrological issues, infections, cardiovascular diseases, respiratory issues and allergic reactions. The respondents highlighted the effects of heat waves, pollution, fires, drought, and floods leading to scarcity of water and food, financial losses and increase of health risk on population. This disturbs the cohesion of system and builds mental stress. The result is supported with other research studies concluding the wide impact of climate change on physical health of human population (Leal Filho et al., 2022) (Babar et al., 2021). The respondents view aligned with theory of the study that climate change is a complex process and impacts every aspect of life and alteration in the daily life eventually reducing the quality of life (Cianconi et al., 2020) (Fatima, 2022). The study results found similar results to other studies and stated that other than adults, children had been affected immensely due to climate events in term of health risk, development, malnutrition, loss of school day, sense of insecurity, depression and adjustment disorders (Helldén et al., 2021) (Dimitrova et al., 2021).

Considering the extensive influence of climate change on environment and human, the current study highlighted the importance of addressing the issue on urgent basis. All respondents established that it is necessary that population should realize regarding climate change and impact and all stake holders including different institutions, government, NGOs, religious and political leaders and all communities should work together to develop road map to face the challenges associated with climate shifts. The finding found to be related with other various studies focusing on the importance of climate advocacy (“Responding to the Impact of Climate Change on Adolescent and Young Adult Health: A Position Paper of the Society for Adolescent Health and Medicine and the International Association for Adolescent Health,” 2025). It is essential to

expand awareness of climate change among the population through use of different mediums. The study outcomes pointed out the necessity of use of education, media and social media platforms to raise the concern. On other hand, study conducted by Khan (Sanaullah Khan, 2016) acknowledged the importance of media and social media applications in spreading the awareness while other study also mentioned the misuse and of social media (Gómez-Casillas & Gómez Márquez, 2023). The current study and other researches highlighted use of different strategies and population behavioral changes to face the challenges of climate change impact including plastic-free and paper-less choices; reducing energy consumption, saving water and energy, utilization of public transportation and recycling (Franziska Gaupp, 2024).

The current study emphasized on increasing the awareness of climate change through integration of climate change and its effect in education curriculum particularly in undergraduate health sciences education. All health faculty participated in the study agreed that it's necessary that education is the way to increase awareness. The study results were similar with other studies that concentrated the integration of climate change in curriculum. The findings concluded that climate change education might lead to new skills, behavior changes and life style choices that will help to have a sustainable and meaningful solutions to mitigate environmental challenges (Anderson, 2012) (Dawson, 2015). Though, the present study focuses on introduction of climate change courses in academic curriculum of various health sciences programs. It mentioned that as population health is the main sector affected by impact of climate change. Therefore, it is necessary to prepare future health professionals to have a better understanding of the impact and provide them with the learning and skillset to encounter the upcoming catastrophe of climate change. The study finding suggested that climate change education might be added as a core course and should be taught as basic and advanced levels. The same recommendation had been provided by other studies to introduce climate courses in academic curriculum of undergraduate and post graduate programs. (Ccami-Bernal et al., 2024) (Sorensen et al., 2024). However, the study had also raised concerns regarding the integration of

climate education courses including the faculty engagement, lack of time and existence of demanding academic curriculum for health programs. The study conducted by Stevenson et al (Stevenson et al., 2017) suggested that climate education can be provided with offering the courses as elective courses, co-curricular activities and community based assignment.

Furthermore, the current and other research studies concluded that climate education should not be limited for health programs, it should be offered for all the educational programs (Buckler & Creech, 2014) (Ramadani et al., 2023). The study participants believed that it should be started earlier as in school program as the behavior modification and lifestyle adaptations will be easier to embedded in nature. The early introduction of climate education will lead younger generations to make informed decisions and have a wide impact on climate change and environment.

Strengths of the Study

1. It's a study on an evolving issue, especially in Pakistan, so that we can create impact and save our environment.
2. This study can be used to develop policies regarding climate change and its awareness in educational institutions.
3. This study comprises participants from different healthcare disciplines.

Limitation of the Study

The study involves only healthcare educators.

Recommendations of the Study

1. Further studies should involve educators from other domains as well so that different perceptions can be gained and overall population can be benefited regarding climate change.
2. Other than educators, these kinds of studies can be conducted with people within the community so that their perception can be highlighted and according to that they can get awareness about climate change and its effects.

Conclusion

The study participants believed that it should be started earlier, as in a school program, as the

behavior modification and lifestyle adaptations will be easier to embed in nature. The early introduction of climate education will lead the younger generation to make informed decisions

and have a wide impact on climate change and the environment.

ACKNOWLEDGEMENTS

No acknowledgement.

DECLARATION OF INTERESTS

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

FUNDING SOURCES

No funding was received for this research.

ETHICS APPROVAL STATEMENT

Ethical approval for the research study was approved by the Iqra University Ethics Review Committee (IU/FHS/ERC/24-017).

CONSENT FOR PUBLICATION

Not Applicable.

References

- Ahmed, N., Islam Khan, T., & Augustine, A. (2018). Climate Change and Environmental Degradation: A Serious Threat to Global Security [climate change, environmental degradation, global security, threats, deforestation, global warming and international actors]. 2018. <https://doi.org/10.46827/ejsss.v0i0.394>
- Anderson, A. (2012). Climate Change Education for Mitigation and Adaptation. *Journal of Education for Sustainable Development*, 6(2), 191-206. <https://doi.org/10.1177/0973408212475199>
- Babar, M. S., Tazyeen, S., Khan, H., Tsagkaris, C., Essar, M. Y., & Ahmad, S. (2021). Impact of climate change on health in Karachi, Pakistan. *The Journal of Climate Change and Health*, 2, 100013. <https://doi.org/https://doi.org/10.1016/j.joclim.2021.100013>
- Banwell, N., Rutherford, S., Mackey, B., & Chu, C. (2018). Towards Improved Linkage of Disaster Risk Reduction and Climate Change Adaptation in Health: A Review. *Int J Environ Res Public Health*, 15(4). <https://doi.org/10.3390/ijerph15040793>
- Buckler, C., & Creech, H. (2014). *Shaping the future, we want: UN Decade of Education for Sustainable Development; final report*. Unesco.
- Ccami-Bernal, F., Barriga-Chambi, F., Quispe-Vicuña, C., Fernandez-Guzman, D., Arredondo-Nontol, R., Arredondo-Nontol, M., & Rojas-Rueda, D. (2024). Health science students' preparedness for climate change: a scoping review on knowledge, attitudes, and practices. *BMC Medical Education*, 24(1), 648. <https://doi.org/10.1186/s12909-024-05629-2>
- Cianconi, P., Betrò, S., & Janiri, L. (2020). The Impact of Climate Change on Mental Health: A Systematic Descriptive Review [Systematic Review]. *Frontiers in Psychiatry*, 11. <https://doi.org/10.3389/fpsy.2020.00074>
- Clayton, S. (2021). Climate Change and Mental Health. *Curr Environ Health Rep*, 8(1), 1-6. <https://doi.org/10.1007/s40572-020-00303-3>
- Creswell, J. W., Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.
- Dawson, V. (2015). Western Australian High School Students' Understandings about the Socioscientific Issue of Climate Change. *International Journal of Science Education*, 37(7), 1024-1043. <https://doi.org/10.1080/09500693.2015.1015181>
- Di Napoli, C., McGushin, A., Romanello, M., Ayeb-Karlsson, S., Cai, W., Chambers, J., . . . Robinson, E. J. (2022). Tracking the impacts of climate change on human health via indicators: lessons from the Lancet Countdown. *BMC Public Health*, 22(1), 663. <https://doi.org/10.1186/s12889-022-13055-6>
- Dimitrova, A., Ingle, V., Basagaña, X., Ranzani, O., Milà, C., Ballester, J., & Tonne, C. (2021). Association between ambient temperature and heat waves with mortality in South Asia: Systematic review and meta-analysis. *Environment International*, 146, 106170. <https://doi.org/https://doi.org/10.1016/j.envint.2020.106170>
- Ebi, K. L., Vanos, J., Baldwin, J. W., Bell, J. E., Hondula, D. M., Errett, N. A., . . . Berry, P. (2021). Extreme Weather and Climate Change: Population Health and Health System Implications. *Annu Rev Public Health*, 42, 293-315. <https://doi.org/10.1146/annurev-publhealth-012420-105026>
- Fatima, E. (2022). Impact of Climate Change on Individual and Community Mental Health. *Journal of Development Policy Research & Practice (JoDPRP)*, 6(1), 85-103. <https://doi.org/10.59926/jodprp.vol06/06>
- Franziska Gaupp, S. E. (2024). Climate Activism, Social Media and Behavioural Change: A Literature Review *International Institute for Applied System Analysis*, 24(007).

- Gómez-Casillas, A., & Gómez Márquez, V. (2023). The effect of social network sites usage in climate change awareness in Latin America. *Population and Environment*, 45(2), 7. <https://doi.org/10.1007/s11111-023-00417-4>
- He, Q., & Silliman, B. R. (2019). Climate Change, Human Impacts, and Coastal Ecosystems in the Anthropocene. *Curr Biol*, 29(19), R1021-r1035. <https://doi.org/10.1016/j.cub.2019.08.042>
- Helldén, D., Andersson, C., Nilsson, M., Ebi, K. L., Friberg, P., & Alfvén, T. (2021). Climate change and child health: a scoping review and an expanded conceptual framework. *The Lancet Planetary Health*, 5(3), e164-e175. [https://doi.org/10.1016/S2542-5196\(20\)30274-6](https://doi.org/10.1016/S2542-5196(20)30274-6)
- Kotcher, J., Maibach, E., Miller, J., Campbell, E., Alqodmani, L., Maiero, M., & Wyns, A. (2021). Views of health professionals on climate change and health: a multinational survey study. *The Lancet Planetary Health*, 5(5), e316-e323. [https://doi.org/10.1016/S2542-5196\(21\)00053-X](https://doi.org/10.1016/S2542-5196(21)00053-X)
- Leal Filho, W., Ternova, L., Fayyaz, M. M., Abubakar, I. R., Kovaleva, M., Donkor, F. K., . . . Begum, H. (2022). An analysis of climate change and health hazards: results from an international study. *International Journal of Climate Change Strategies and Management*, 14(4), 375-398. <https://doi.org/https://doi.org/10.1108/IJCCSM-08-2021-0090>
- Létourneau, S., Roshan, A., Kitching, G. T., Robson, J., Walker, C., Xu, C., . . . Xie, E. (2023). Climate change and health in medical school curricula: A national survey of medical students' experiences, attitudes and interests. *The Journal of Climate Change and Health*, 11, 100226. <https://doi.org/https://doi.org/10.1016/j.joclim.2023.100226>
- Nikendei, C., Bugaj, T. J., Nikendei, F., Köhl, S. J., & Köhl, M. (2020). [Climate change: Causes, consequences, solutions and public health care implications]. *Z Evid Fortbild Qual Gesundheitswes*, 156-157, 59-67. <https://doi.org/10.1016/j.zefq.2020.07.008> (Klimawandel: Ursachen, Folgen, Lösungsansätze und Implikationen für das Gesundheitswesen.)
- Ramadani, L., Khanal, S., & Boeckmann, M. (2023). Climate change and health in school-based education: A scoping review protocol. *PLoS One*, 18(3), e0282431. <https://doi.org/10.1371/journal.pone.0282431>
- Responding to the Impact of Climate Change on Adolescent and Young Adult Health: A Position Paper of the Society for Adolescent Health and Medicine and the International Association for Adolescent Health. (2025). *Journal of Adolescent Health*, 76(1), 159-165. <https://doi.org/https://doi.org/10.1016/j.jadohealth.2024.09.015>
- Rising, J., Tedesco, M., Piontek, F., & Stainforth, D. A. (2022). The missing risks of climate change. *Nature*, 610(7933), 643-651. <https://doi.org/10.1038/s41586-022-05243-6>
- Sanaullah Khan, D. R. M. K. (2016). Role of Media in Tackling Climate Change Issue – A Case Study of Pakistan. *Pakistan Research Database-Margalla Paper*, 20(1).
- Sarfaty, M., Kreslake, J., Ewart, G., Guidotti, T. L., Thurston, G. D., Balmes, J. R., & Maibach, E. W. (2016). Survey of International Members of the American Thoracic Society on Climate Change and Health. *Ann Am Thorac Soc*, 13(10), 1808-1813. <https://doi.org/10.1513/AnnalsATS.201604-229BC>
- Segal, T. R., & Giudice, L. C. (2022). Systematic review of climate change effects on reproductive health. *Fertil Steril*, 118(2), 215-223. <https://doi.org/10.1016/j.fertnstert.2022.06.005>
- Sorensen, C., Magalhães, D., Hamacher, N., Sullivan, J. K., Weinstein, H. N. W., Pinho-Gomes, A.-C., . . . Zhang, Y. (2024). Climate and health education in public health schools worldwide during 2023–24: a survey. *The Lancet Planetary Health*, 8(12), e1010-e1019. [https://doi.org/10.1016/S2542-5196\(24\)00284-5](https://doi.org/10.1016/S2542-5196(24)00284-5)
- Stevenson, R. B., Nicholls, J., & Whitehouse, H. (2017). What Is Climate Change Education? *Curriculum Perspectives*, 37(1), 67-71. <https://doi.org/10.1007/s41297-017-0015-9>