

PERCEPTION AND KNOWLEDGE OF CLIMATE CHANGE IMPACT ON HEALTH AMONG MEDICAL STUDENTS IN SIERRA LEONE

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ABSTRACT

Background: Climate change is a severe and growing threat to public health, with disproportionate impacts falling on resource-limited nations like Sierra Leone. While future healthcare providers must be fully prepared to manage these escalating challenges, there remains a notable lack of research exploring how medical students actually perceive and understand the critical links between climate and health.

Methods: We conducted a qualitative study involving 20 medical students from the College of Medicine and Allied Health Sciences (COMAHS) at the University of Sierra Leone. Using purposive sampling, we purposefully included individuals from both basic and clinical sciences to capture a broad range of perspectives. Data were collected through focus group discussions and in-depth interviews, then systematically evaluated using thematic analysis via NVivo 15 software.

Results: Our analysis identified five central themes. Students demonstrated a strong awareness of climate-driven health outcomes, frequently highlighting increases in malaria, cholera, and mental health struggles. Although their grasp of the exact scientific mechanisms varied, participants expressed a clear, proactive willingness to adopt sustainable behaviors and advocate for their communities. However, their intent to act is heavily frustrated by systemic barriers; such as poverty and political inertia, alongside a striking consensus that current medical curricula lack practical, climate-focused training.

Conclusions: Medical students in Sierra Leone recognize the health threats posed by climate change and are eager to drive positive change, but they are currently held back by educational and institutional shortcomings. Embedding dedicated climate-health content into medical training and actively supporting student advocacy are critical steps toward building a resilient, future-ready healthcare workforce.

Keywords: Climate-health, Medical education, Sierra Leone, Advocacy, Qualitative study, Thematic analysis.

INTRODUCTION

The World Health Organization identifies climate change as the most significant threat to global health in this century, with the potential to reverse fifty years of progress in public health (WHO, 2023). Evidence suggests that the changing climate interacts with the social factors that shape health, driving the emergence of diseases and worsening existing inequities, especially in regions where resources are scarce, such as Sierra Leone (Karaliuniene, 2022; Schwaab et al., 2022). These impacts occur through a variety of pathways that affect the control of infectious disease, the stability of mental health, and the overall resilience of healthcare systems (Schwaab et al., 2022).

The ways in which climate change affects health are diverse. Some effects are direct, such as the increase in illnesses caused by heat or the expansion of diseases carried by insects like malaria, as rising temperatures and unpredictable rainfall patterns change the environment (Hayes et al., 2018). Other consequences are indirect, including malnutrition caused by disruptions to agriculture, outbreaks of waterborne illness following major floods, and deep psychological distress. Groups that are particularly vulnerable, including children, the elderly, and individuals with conditions that existed before the crisis, suffer more because they lack the capacity to adapt (Hathaway & Maibach, 2018; Schwaab et al., 2022). Nations with low or middle incomes face this heightened vulnerability despite their minimal role in global emissions, a fact clearly seen in the pressure put on the health infrastructure of Sierra Leone during previous crises (Rogers et al., 2023; Shea et al., 2020).

In Sierra Leone, the climate crisis is most evident in the frequent and devastating floods in Freetown, where inadequate planning for urban growth intensifies the impact of disasters. For over a decade, these events have followed a predictable pattern of crisis followed by reactive measures, such as emergency meetings with donors and short interventions by non-governmental organizations, yet the lessons for enduring management and preparedness often go unheeded (Engage Salone, n.d.). These cycles lead to outbreaks of cholera and put an immense load on the health system, emphasizing the urgent need for health professionals who understand the science of climate (Atwoli et al., 2021).

Students of medicine are the future leaders of this response. However, their perceptions and their understanding of the links between climate and health have not been sufficiently studied, particularly in African contexts where vulnerability is high (Heyari, 2023). Improving the awareness of future doctors is vital, as they are positioned to act as advocates for public health and to lead the reforms in education required to address the environmental factors that determine health (Schwaab et al., 2022; Atwoli et al., 2021).

Despite the importance of this issue, the medical curriculum in institutions around the world, including at the College of Medicine and Allied Health Sciences in Sierra Leone, shows significant gaps (Rogers et al., 2023). Global surveys indicate that fewer than twenty percent of medical schools include content on climate and health in a systematic way, leaving those who graduate unprepared for changes in the patterns of disease (Schwaab et al., 2022). This gap is especially deep in nations with low or middle incomes, where the health system is already strained by poverty and fragile infrastructure (Shea et al., 2020). For this

reason, identifying the current level of awareness among students at this institution is of great importance, as they will be the ones to manage the growing burden of health issues related to the environment (Rogers et al., 2023).

Currently, there is very little research into how much trainees in environments with limited resources know about climate and health, as most existing studies focus on doctors already in practice in wealthier nations (Heyari, 2023). This study aims to fill that gap by exploring the perceptions and the awareness of the health impacts of climate change among medical students at the University of Sierra Leone. The specific objectives are: first, to explore how students perceive the effects of climate change on health; second, to describe how they understand the mechanisms behind these impacts; and third, to determine how these views influence their actions regarding adaptation and the reduction of risks.

By identifying specific areas where knowledge is lacking, these findings will help create better strategies for education, ultimately giving the next generation of physicians in Sierra Leone the tools to lead change as they face environmental challenges.

METHODS

Study Design

Study Design

This qualitative study employed focus group discussions (FGDs) and in-depth interviews (IDIs) to explore medical students' perceptions and awareness of climate change's health impacts at the College of Medicine and Allied Health Sciences (COMAHS), University of Sierra Leone. Purposive sampling ensured information-rich cases, with thematic analysis conducted using NVivo 15 software following Braun and Clarke's six-phase framework:

familiarization, coding, theme generation, review, definition, and reporting. This approach prioritized depth over generalizability, achieving thematic saturation after 20 participants.

Study Setting

Data collection occurred at COMAHS in Freetown, Sierra Leone, selected for its status as the nation's primary medical training institution serving ~800 professional-year students committed to sustainability initiatives. The campus provided a familiar, accessible environment conducive to open discussion on climate-health topics.

Participants and Sampling

The study population comprised all professional-year medical students (Years 1-6) at COMAHS. Twenty participants were purposively recruited: 12 (60%) from clinical years (4th-6th) offering practice-based insights, and 8 (40%) from basic sciences (1st-3rd) providing theoretical perspectives. This distribution captured diverse experiences while ensuring saturation, as confirmed by non-emergence of new themes in final FGDs/IDIs.

Eligibility Criteria

Participants were eligible if they were enrolled COMAHS medical students in professional years, willing to provide informed consent, and available during the data collection period. Students were excluded if they were premedical or non-COMAHS enrollees, refused consent or withdrew, or were unavailable during the study period.

Data Collection

Four FGDs (4-6 participants each) and six IDIs were conducted in private campus rooms. Semi-structured guides explored perceptions (e.g.,

"How do you see climate change affecting health in Sierra Leone?"), mechanisms (e.g., "What pathways link weather changes to diseases?"), and actions (e.g., "How might this influence your practice?"). Sessions lasted 45-90 minutes, audio-recorded with consent, and facilitated by a moderator (AAK) and note-taker. Participants stated unique codes (P1-P20) before responses to ensure anonymity during transcription. Iterative probing refined emerging themes.

Data Management

Recordings were transcribed verbatim, de-identified, and checked for accuracy. Digital files were password-protected on encrypted university servers with researcher-only access; physical notes secured in locked cabinets. Regular backups prevented data loss, maintaining a clear audit trail per COREQ guidelines.

Data Analysis

Transcripts underwent inductive thematic analysis in NVivo 15. Two researchers independently coded initial transcripts, achieving 87% intercoder reliability, then collaboratively refined 150+ codes into five overarching themes and 15 subthemes. Constant comparison and member-checking (sharing summary findings with 5 participants) enhanced credibility. Trustworthiness was established through thick descriptions, reflexivity statements, and peer debriefing.

Ethical Considerations

Permission was granted by the Dean, Faculty of Clinical Sciences, COMAHS-USL. Written informed consent detailed study aims, voluntary participation, confidentiality measures, and withdrawal rights. No incentives were offered. Aggregate reporting protected identities, with

transcripts destroyed post-publication. The study adhered to Helsinki Declaration principles.

RESULTS

Thematic analysis of the transcripts from four focus group discussions and six in-depth interviews with 20 medical students yielded five major themes and 15 subthemes, supported by 152 unique codes. Data saturation was achieved by the third focus group, as no new thematic categories emerged. The sample consisted of clinical students (n=12, 60%), who provided insights based on patient interactions, and basic sciences students (n=8, 40%), who offered more theoretical perspectives.

Theme 1: Health Impacts and Global Effects

Participants identified a wide range of health consequences linked to local climate patterns, contributing 28% of the total codes. Frequently cited issues included respiratory conditions, heat-related illnesses such as dehydration, and vector-borne diseases like malaria. Mental health effects, including anxiety and depression related to environmental uncertainty, were also prominent.

Local observations were central to student perspectives: *"Ever since my mother gave birth to me, I have never fainted, until one day... I started sweating profusely and fainted"* (P6). Participants also linked climate instability to local disasters, such as the Regent mudslide (P11), and suggested that deforestation has altered vector ecology: *"Forests turned to buildings... mosquitoes everywhere"* (P17).

Theme 2: Climate-Health Mechanisms

Students described the pathways connecting climate to health with varying scientific precision. While some offered broad definitions, others engaged in biomedical reasoning. For example, P14 attempted to map the physiological response to

heat: *"Exposure to high temperature leads to dehydration, which causes hypoperfusion... and consequently raises blood pressure."*

Key mechanisms identified included thermal stress causing cardiovascular strain, and shifting land use creating new mosquito breeding sites (P20). Flooding was also recognized as a primary precursor to waterborne disease: *"After the Makeni floods, diarrhea cases spiked from dirty water"* (P12).

Theme 3: Personal and Professional Behavioral Influence

Climate awareness influenced the daily habits of 70% of participants. Personal adaptations included increased hydration and the avoidance of outdoor physical activity during peak heat hours. Professionally, students expressed a strong commitment to advocacy: *"I want to educate less privileged communities; their habits unknowingly worsen climate change"* (P13). However, participants noted that academic workloads and a lack of institutional support often acted as barriers to organizing formal awareness campaigns.

Theme 4: Barriers and Enablers to Action

Participants identified several systemic obstacles to climate action. Socioeconomic factors were paramount, with P4 noting that *"hunger supersedes climate-related concerns."* Political disengagement and a lack of hospital equipment for environmental emergencies were also cited. Conversely, enablers included strong community leadership where local chiefs enforce environmental rules (P2) and the potential for grassroots mobilization through religious institutions (P18).

Theme 5: Mitigation, Adaptation, and Educational Gaps

Proposed strategies for resilience focused heavily on afforestation (45%) and improved waste management (35%). Students advocated for *"planting a tree for every one cut"* (P8) and emphasized that responsible waste disposal is vital for preventing the drainage clogs that lead to urban flooding.

Regarding medical education, 80% of participants described the current curriculum at COMAHS as overly theoretical. A common critique was that lectures on climate change often ignored the specific context of Sierra Leone (P16). Participants recommended that community medicine be elevated from an *"underdog module"* to a graded, practical component of their training, including hands-on activities such as tree-planting during fieldwork (P2, P9)..

DISCUSSIONS

Contextualizing the Findings

The medical students at COMAHS exhibited a moderate level of awareness regarding the links between climate and health. They successfully identified both direct impacts, such as the shift in malaria vectors, and indirect consequences, such as the mental health struggles following natural disasters. These observations align with global frameworks that categorize climate change as a fundamental determinant of health (WHO, 2023; Karaliuniene, 2022). Personal accounts shared during the study, including a participant's experience with heat-induced fainting (P6), reflect the specific vulnerabilities of nations with low or middle incomes, where extreme heat frequently

worsens non-communicable conditions (Schwaab et al., 2022). However, the depth of scientific understanding varied among the students. While some offered precise explanations, such as the metabolic chain leading from dehydration to hypertension (P14), others provided more simplified views. This inconsistency suggests a solid foundational knowledge that lacks technical depth, a finding that is consistent with reports of gaps in medical education globally (Rogers et al., 2023). The frequent mention of local events, such as the floods in Freetown and the mudslides in Regent, highlights the importance of context. The students’ concerns extended beyond abstract global narratives to focus on risks specific to Sierra Leone, including the outbreaks of cholera that follow flooding (Atwoli et al., 2021). These results mirror other African studies where students connect environmental damage to endemic diseases (Heyari, 2023), and they underscore the urgent need for training programs to include localized case studies.

The Drivers of Personal and Professional Action

A significant finding of this study was the high level of proactive behavior, with seventy percent of participants making personal adaptations and eighty percent expressing a strong intent to engage in advocacy. These figures exceed those found in surveys from high-income nations, where often fewer than half of trainees engage with climate-related topics (Schwaab et al., 2022). While barriers such as poverty and political instability reflect the difficult realities of life in Sierra Leone (Shea et al., 2020), the identification of community chiefs as enablers suggests a culturally specific opportunity for progress that is often overlooked in international literature. The strategies for mitigation proposed by the students, such as the planting of trees and the management of waste, are

highly practical for environments with limited resources and align with international recommendations for adaptation in Africa (Hayes et al., 2018). Furthermore, the suggestion that physicians should take on political roles (P17) represents an innovative perspective on the traditional duties of a doctor, supporting the idea that health professionals must act as advocates for policy change (Hathaway & Maibach, 2018).

Implications for Medical Education

The high level of dissatisfaction with the current curriculum (80%) confirms global evidence that climate-health issues are often neglected in medical training (Rogers et al., 2023). Participants particularly noted that community medicine modules are frequently undervalued. The demand for hands-on content that focuses on the Sierra Leonean context; such as field work involving tree planting; parallels successful pilots in other regions (Schwaab et al., 2022). Integrating these practical elements could help future doctors develop the competencies needed for a practice that is resilient to the effects of climate change (Atwoli et al., 2021).

Finding	Alignment with Literature	Original Contribution of this Study
Variable scientific knowledge	Global gaps in curricula (Rogers et al., 2023)	Specific focus on pathways like deforestation and malaria in Sierra Leone
High motivation	Documented as lower in wealthier	Call for doctors to take on

Finding	Alignment with Literature	Original Contribution of this Study
for advocacy	nations (Schwaab et al., 2022)	formal political roles (P17)
Practical local strategies	Focus on African adaptation (Hayes et al., 2018)	Use of community chiefs as key enablers for action

Strengths and Limitations

While the reliance on data reported by the participants introduces the possibility of social desirability bias, we mitigated this through the use of anonymity and the triangulation of data from both focus groups and interviews. The study was conducted at a single site, which may limit the ability to generalize the results; however, the use of purposive sampling ensured a diverse range of perspectives. We achieved data saturation with a sample of twenty participants, and the use of rigorous analysis software helped ensure the findings are transferable. Finally, the perspective of the researcher as a medical student provided valuable insider insights, while peer debriefing was used to maintain objectivity.

CONCLUSION AND RECOMMENDATIONS

These findings suggest a clear path forward for reform at the COMAHS. There is a need for mandatory modules on climate and health that include practical exercises, such as simulations of flood responses. At the national level, the Ministry

of Health in Sierra Leone should consider including climate competencies in the requirements for professional licensing. Globally, these insights from a nation with a low income should inform the development of planetary health education by prioritizing training that is specific to the local context (Heyari, 2023)..

COMPETING INTERESTS

All the authors involved in writing the content of this manuscript and disclosed no conflicts of interest whatsoever.

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