



“Children at the Frontline of a Warming Planet: Climate Change, Child Health Consequences, and Critical Nursing Implications”

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Abstract: Climate change has emerged as one of the most significant global public health challenges of the 21st century, disproportionately affecting vulnerable populations, particularly children. Due to their physiological immaturity, dependency, and developing immune and organ systems, children are uniquely susceptible to climate-related environmental hazards. Rising global temperatures, extreme weather events, air pollution, food and water insecurity, and the spread of climate-sensitive infectious diseases pose substantial threats to child health and development. These impacts manifest as increased morbidity and mortality from respiratory illnesses, malnutrition, vector-borne diseases, heat-related disorders, mental health disturbances, and long-term developmental consequences. Nurses, especially those working in pediatric, community, school, and public health settings, play a pivotal role in mitigating these adverse effects through prevention, advocacy, education, early detection, and climate-resilient healthcare delivery. This review article examines the multifaceted effects of climate change on child health and highlights the crucial implications for nursing practice, education, research, and policy. Strengthening nursing capacity to address climate-related child health risks is essential for safeguarding the well-being of present and future generations.

Keywords: Climate change; Child health; Pediatric nursing; Environmental health; Public health nursing; Vulnerable populations; Nursing advocacy

Introduction

Climate change is no longer a distant environmental issue but a pressing public health emergency with profound implications for human health across the lifespan. Scientific consensus recognizes that anthropogenic climate change, driven primarily by greenhouse gas emissions, has resulted in rising global temperatures, altered weather patterns, sea-level rise, and an increase in the frequency and intensity of extreme weather events. While climate change affects all populations, children represent one of the most vulnerable groups due to their biological, developmental, and social characteristics.

Children breathe more air, drink more water, and consume more food per unit of body weight than adults, increasing their exposure to environmental contaminants. Their physiological systems, including the respiratory, immune, and neurological systems, are still developing, making them more susceptible to environmental stressors. Additionally, children depend on caregivers and social

systems for protection, nutrition, and healthcare, making them particularly vulnerable in settings of poverty, displacement, and weak health infrastructure.

Nurses, as the largest group of healthcare professionals globally, are strategically positioned to recognize, prevent, and respond to climate-related child health challenges. This review explores the pathways through which climate change affects child health and outlines the essential nursing implications required to protect children in an era of environmental uncertainty.

Overview of Climate Change and Environmental Pathways

Climate change refers to long-term alterations in temperature, precipitation, wind patterns, and other aspects of the Earth's climate system. Key drivers include fossil fuel combustion, deforestation, industrialization, and unsustainable agricultural practices. These changes have



led to environmental disruptions that directly and indirectly influence child health.

Rising temperatures contribute to heatwaves, droughts, and wildfires, while altered precipitation patterns result in floods and water scarcity. Climate change also exacerbates air pollution and influences ecosystems that regulate infectious disease transmission. These environmental pathways interact with social determinants of health, such as poverty, housing, education, and access to healthcare, amplifying health inequities among children.

Impact of Climate Change on Child Physical Health

Heat-Related Illnesses

Children are particularly susceptible to heat-related illnesses due to their limited ability to regulate body temperature, higher metabolic rates, and dependence on caregivers for hydration and environmental control. Prolonged exposure to high temperatures increases the risk of dehydration, heat exhaustion, heatstroke, and electrolyte imbalances. Infants and young children are at heightened risk, especially in low-resource settings where cooling systems and safe water access may be limited. Nurses frequently encounter children presenting with heat-related symptoms in emergency and community settings. Early recognition, caregiver education, and community-level prevention strategies are critical nursing responsibilities.

Respiratory Disorders and Air Pollution

Climate change worsens air quality through increased ground-level ozone, particulate matter, and allergens. Children exposed to air pollution are more likely to develop asthma, allergic rhinitis, bronchitis, and other chronic respiratory conditions. Climate-induced wildfires further intensify air pollution, leading to acute respiratory exacerbations and increased hospital admissions among children.

Pediatric nurses play a vital role in monitoring respiratory symptoms, educating families on pollution avoidance strategies, and supporting long-term disease management in children with chronic respiratory conditions.

Infectious and Vector-Borne Diseases

Climate change alters the geographic distribution and seasonality of infectious diseases. Warmer temperatures and increased rainfall facilitate the spread of vector-borne diseases such as malaria, dengue, chikungunya, and Zika virus. Flooding and poor sanitation increase the incidence of waterborne diseases, including diarrhea, cholera, and typhoid, which remain leading causes of childhood morbidity and mortality in many regions.

Children are more vulnerable to severe disease outcomes due to immature immune systems. Nurses are central to disease surveillance, immunization programs, early diagnosis, infection control, and health education at the community level.

Malnutrition and Food Insecurity

Climate change significantly affects agricultural productivity, food availability, and nutritional quality. Droughts, floods, and extreme weather events disrupt food systems, leading to food shortages and rising prices. Children, particularly in low- and middle-income countries, face increased risks of undernutrition, stunting, wasting, and micronutrient deficiencies.

Malnutrition during childhood has long-term consequences, including impaired cognitive development, weakened immunity, and increased susceptibility to chronic diseases. Nurses working in maternal and child health programs are crucial in nutritional assessment, growth monitoring, breastfeeding support, and community-based nutrition interventions.

Impact on Child Mental Health and Development

Climate change also exerts significant psychological and developmental impacts on children. Exposure to climate-related disasters such as floods, cyclones, wildfires, and displacement can result in trauma, anxiety, depression, sleep disturbances, and post-traumatic stress disorder. Children may experience fear, uncertainty, and grief related to environmental loss and family disruption.

Chronic stress associated with climate instability can impair emotional regulation, learning, and social development. Nurses, particularly school and community



health nurses, are often the first point of contact for children experiencing psychological distress. Providing psychosocial support, screening for mental health issues, and facilitating referrals are essential nursing functions.

Social Determinants, Inequity, and Vulnerable Populations

Climate change exacerbates existing social and health inequities. Children living in poverty, informal settlements, coastal regions, and disaster-prone areas face disproportionately higher risks. Limited access to healthcare, clean water, sanitation, education, and nutritious food further compounds the impact of climate-related health threats.

Indigenous children, migrant populations, and those with chronic illnesses or disabilities are particularly vulnerable. Nurses must adopt an equity-focused approach, addressing social determinants of health and advocating for inclusive, child-centered climate policies.

Nursing Implications for Practice

Nurses play a pivotal role in addressing the health impacts of climate change on children through prevention, care, and advocacy. In clinical settings, nurses must incorporate environmental health assessments into routine pediatric care, recognizing climate-related risk factors and symptoms.

Community and public health nurses are essential in health promotion, disaster preparedness, and resilience-building initiatives. Educating families on heat protection, safe water practices, nutrition, infection prevention, and emergency preparedness empowers communities to protect children from climate-related risks.

Nursing Education and Capacity Building

Integrating climate change and environmental health into nursing curricula is essential to prepare future nurses for emerging health challenges. Education should emphasize the links between climate change, child health, and nursing responsibilities, fostering critical thinking and leadership skills.

Continuing professional development programs can enhance nurses' knowledge and competencies in climate-resilient healthcare, disaster response, and sustainable practices. Empowered and informed nurses are better equipped to protect child health in a changing climate.

Nursing Research and Evidence-Based Practice

There is a growing need for nursing-led research exploring the health impacts of climate change on children and evaluating effective interventions. Research priorities include identifying vulnerable populations, assessing long-term developmental outcomes, and testing community-based prevention strategies.

Evidence generated through nursing research can inform clinical guidelines, public health programs, and policy decisions. Nurses should be encouraged to participate in interdisciplinary research addressing climate and child health.

Policy Advocacy and Leadership Roles of Nurses

Nurses have a strong ethical obligation to advocate for policies that protect child health and promote environmental sustainability. At local, national, and global levels, nurses can influence policy by participating in professional organizations, engaging with policymakers, and raising public awareness.

Advocacy efforts may focus on reducing environmental pollution, strengthening health systems, improving disaster preparedness, and promoting climate justice. By amplifying the voices of children and families, nurses can contribute to meaningful and lasting change.

Conclusion

Climate change poses a profound and escalating threat to child health, affecting physical well-being, mental health, nutrition, and development. Children, as a vulnerable population, bear a disproportionate burden of climate-related health risks. Nurses, through their diverse roles in healthcare delivery, education, research, and advocacy, are uniquely positioned to address these challenges.

Strengthening nursing capacity to respond to climate change is essential for protecting child health and



advancing health equity. A proactive, informed, and collaborative nursing response can help mitigate the impacts of climate change and ensure a healthier, more sustainable future for children worldwide.

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