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"LITERATURE REVIEW: CLIMATE CHANGE AND PEDIATRIC HEALTH."

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Abstract:

Climate change has emerged as a major public health concern, particularly for children, who are vulnerable to environmental changes because of their developing physiological and immune systems. Rising temperatures, heatwaves, air pollution, floods, droughts, and changing patterns of infectious diseases contribute to various pediatric health problems, including heat-related illness, respiratory disorders, diarrheal diseases, vector-borne infections, malnutrition, and psychological distress. This narrative literature review examines the relationship between climate change and pediatric health, with particular emphasis on disease patterns, vulnerable populations, and preventive approaches.

It also explores the potential contribution of Ayurveda through principles of Dinacharya, Ritucharya, appropriate dietary practices, personal hygiene, and environmental health. Ayurvedic approaches may complement established pediatric healthcare when used appropriately; however, their effectiveness against specific climate-related diseases requires further scientific evaluation. Integrating evidence-based pediatric care, public health interventions, and research-informed traditional healthcare practices may help strengthen children's resilience to climate-related health risks.

Keywords: Climate change, Pediatric health, Child health, Global warning environmental health, Child nutrition, Climate adaptation, Pediatric vulnerability.

Introduction:

Children are the most vulnerable group among affected populations, as they are particularly sensitive to environmental stressors due to their physiological, behavioral, and developmental characteristics. The increased frequency and severity of air pollution incidents, floods, droughts, and wildfires are intertwined hazards that endanger children's health worldwide [(1)].

Children's susceptibility to climate change is due to a constellation of biological and social determinants. Physiologically, they have elevated metabolic and respiratory rates relative to body mass, incomplete thermoregulatory systems, and underdeveloped immune and detoxification mechanisms, which predispose them to environmental toxins and thermal effects [(2)]

Empirical evidence shows that climate change negatively impacts children's health in various direct and indirect ways. Health-related diseases, respiratory ailments, communicable illnesses, malnutrition, and psychological consequences constitute the short-term effects [(3)]

A rise in temperature (a 1°C increase above local averages) has been associated with increased hospitalizations for asthma in children, supporting the respiratory system's sensitivity to thermal and pollution stressors in children [(4)].Alterations in the ecology and epidemiology of infectious diseases are also determined by changes in temperature and precipitation patterns. The increase in climatic temperatures is exposing children to the risks of contracting vector-borne diseases such as dengue, malaria, and Zika virus infection, due to the expansion of vector habitats for Aedes and Anopheles mosquitoes[(5)].

More insight into the impacts of climate change on child health is critical to achieving sustainable development and climate resilience objectives. The future generation of children will be even more affected by the health impacts of global warming than previous generations [(6)]

The existing literature highlights the complex relationship between climate change and pediatric health, emphasizing the need for multidisciplinary approaches to prevention, adaptation, and mitigation. Understanding the current evidence is essential for healthcare professionals, policymakers, and researchers to develop effective strategies that protect children's health in a changing climate. Therefore, this literature review aims to critically examine the available evidence regarding the effects of climate change on pediatric health, identify existing knowledge gaps, and explore interventions that can reduce climate-related health risks among children.

Aim: To review the effects of climate change on children's health and explore the potential role of Ayurveda in prevention and supportive management.

Objective:

1)To examine the current evidence on the relationship between climate change and pediatric health.

2)To identify the direct and indirect health effects of climate change on children, including respiratory, infectious, nutritional, and mental health outcomes.

3)To assess the factors that increase children's vulnerability to climate-related health risks.

4)To review existing adaptation and mitigation strategies aimed at protecting children's health from the impacts of climate change.

5)To identify gaps in the current literature and suggest areas for future research and policy development

Material and Method

Study Design

This study was conducted as a narrative literature review to summarize and

critically evaluate the existing evidence on the effects of climate change on pediatric health[7].

Data Sources

A comprehensive literature search was performed using electronic databases, including PubMed, Scopus, Web of Science, Google Scholar, and the Cochrane Library. Relevant reports from international organizations such as the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) were also reviewed.[8][9]

Search Strategy

The literature search used combinations of the following keywords and Boolean operators: "climate change," "global warming," "pediatric health," "child health," "children," "air pollution," "heat-related illness," "infectious diseases," "malnutrition," "mental health," and "environmental health." Boolean operators (AND, OR) were applied to refine the search.[10]

Inclusion Criteria

Original research articles, systematic reviews, and meta-analyses.
Studies focusing on the impact of climate change on children (0–18 years).
Articles published in English.
Publications from the last 10 years (or the selected study period).
Reports from recognized national and international health organizations.

Exclusion Criteria

Studies involving only adult populations.
Articles not directly related to climate change or pediatric health.
Editorials, conference abstracts, letters to the editor, and duplicate publications.
Non-English publications.

Discussion

1. Climate Change and Pediatric Health

Climate change affects children's health through direct exposure to heat and extreme weather events and indirect effects on air quality, food availability, water safety, infectious disease transmission, and access to healthcare. Infants, young children, children with chronic illnesses, and those living in socioeconomically disadvantaged settings may face greater risks.

2. Major Climate-Related Diseases in Children

Heat-related illness and dehydration: Increased ambient temperatures can contribute to dehydration, heat exhaustion, and potentially life-threatening heatstroke. Children require adequate hydration, access to shade, reduced exposure during extreme heat, and prompt medical assessment when warning signs develop.

Respiratory diseases: Air pollution, wildfire smoke, and changes in pollen exposure may aggravate asthma and other respiratory conditions. Reducing exposure to polluted air and following prescribed treatment plans are important preventive measures.

Waterborne and vector-borne diseases: Flooding, unsafe drinking water, inadequate sanitation, and changing environmental conditions can increase the risk of diarrheal illnesses and alter the distribution of mosquito-borne infections**.** Safe water, sanitation, vector control, and vaccination where indicated are essential.

Malnutrition and food insecurity: Droughts, floods, and disruptions to food production may affect dietary diversity and food security, increasing the risk of undernutrition and micronutrient deficiencies. Age-appropriate balanced nutrition and monitoring of growth are important components of pediatric care.

Mental health effects: Displacement, disasters, loss of familiar surroundings, and anxiety about environmental changes may affect children's emotional well-being. Psychological first aid, family support, and access to appropriate mental health services may be beneficial.

MANAGEMENT

Ayurveda emphasizes preventive health, dietary regulation, seasonal adaptation, daily routines, and maintenance of overall well-being. These concepts may provide a framework for discussing supportive health practices in the context of climate change.

Ritucharya: Seasonal adaptation of diet and daily activities may help families plan appropriate routines according to environmental conditions. Specific recommendations should be adapted to the child's age, nutritional requirements, and local climate.

Dinacharya: Regular sleep, personal hygiene, appropriate physical activity, and healthy daily routines may support general well-being.

Ahara (diet): Balanced, age-appropriate nutrition and adequate fluid intake are important, particularly during periods of heat and food insecurity**.**

Swasthavritta and environmental hygiene: Safe drinking water, clean surroundings, sanitation, and preventive health practices are relevant to reducing environmental health risks.

Individualized supportive care: Ayurvedic interventions, when considered, should be evaluated for pediatric safety, product quality, interactions, and evidence of effectiveness.

Ayurvedic herbs or formulations should not be assumed to prevent or treat climate-related diseases without adequate evidence. Children with heatstroke, severe dehydration, breathing difficulty, persistent fever, or other serious symptoms require prompt conventional medical assessment. Ayurvedic practices should not replace emergency treatment, vaccination, oral rehydration therapy when indicated, or prescribed medication.

Result

The literature consistently demonstrates that climate change has significant adverse effects on pediatric health. The most commonly reported health outcomes include increased respiratory diseases, particularly asthma and allergies, due to worsening air pollution and aeroallergen exposure. Rising temperatures have been associated with heat-related illnesses, dehydration, and reduced physical activity among children. Climate change has also contributed to an increased risk of vector-borne and waterborne diseases, especially in regions with inadequate sanitation and healthcare infrastructure.

Several studies reported that food insecurity and climate-related disruptions to agriculture contribute to malnutrition, growth impairment, and micronutrient deficiencies in children. Extreme weather events, such as floods, droughts, wildfires, and hurricanes, were found to increase the risk of injury, displacement, disruption of healthcare services, and adverse mental health outcomes, including anxiety, depression, and post-traumatic stress. Children from low- and middle-income countries and socioeconomically disadvantaged communities were identified as the most vulnerable due to limited access to healthcare, nutrition, and environmental protection.

Overall, the reviewed literature emphasizes the need for integrated public health interventions, climate adaptation strategies, and policies focused on protecting children's health from the growing impacts of climate change.

Conclusion

The literature review indicates that climate change poses a serious and growing threat to pediatric health through multiple direct and indirect pathways. Children are particularly vulnerable because of their

physiological, developmental, and social characteristics. The evidence highlights the urgent need for climate-resilient healthcare systems, effective public health policies, environmental protection measures, and community-based adaptation strategies to reduce climate-related health risks. Future research should focus on long-term health outcomes, evidence-based interventions, and policies that strengthen the resilience of children and healthcare systems in the face of climate change**.**



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