Review Article

University J Dent Scie 2024; Vol. 10, Issue 4

Climate change and your smile: unveiling the oral health impacts of global warming- A scoping review.

Abstract:

Background: Global warming, a major public health hazard, is affecting oral health globally. Climate change, including temperature extremes, UV radiation, dietary changes, water scarcity, and socioeconomic impacts, is causing oral health issues. The purpose of this review is to assess the effect of global warming in oral cavity at the moment.

Methods: A thorough search for research published between 2000 and 2024 was done using various online data bases. Relevant studies were identified, screened, and included in accordance with the Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) guidelines standards as per the selection criterion.

Results: A total of 45 studies satisfied the requirements for inclusion. Significant findings show thatglobal warming plays an important role in oral infections.

Conclusion: Vulnerable communities are most affected, necessitating technical advancements, international collaboration, and integrated public health strategies to maintain accessible dental care systems to combat the effects of global warming.

Key-words: Global warming, oral health, climate change, dental caries, periodontal disease.

Introduction:

One of the main aspects of climate change is global warming, which is the gradual increase in Earth's average surface temperature caused by human activity, particularly the release of greenhouse gases into the atmosphere.[1] Oral health is only one of the many areas of human health that are affected by this phenomenon. The precise effects of climate change on dental health are still not fully understood, despite the increasing body of research on this topic.[2]To close this information gap, this review examines the connection between oral health and global warming, as well as its historical background, types of impacts, effects on the oral cavity specifically, and future implications and initiatives.

Materials and Methods:

Literature search:

A systematic review was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The PubMed, Scopus, Web of Science and Google Scholar databases were searched for relevant literature from January 2000 to the present. The search terms included "global warming", "climate change", "oral health", "dental health", "tooth decay", "periodontal disease", and "public health".

Access this article online

Website: www.ujds.in

Quick Response Code

DOI: https://doi.org/10.21276/ujds.2024.10.4.12

[1]NADEER THOMMANCHERI, [2]SAVEEN NELLIKOTTU SOMAN, [3]AKHIL SAJITH KUMAR, [4]MOHAMED HARRIS KAIPALLI THODIYIL

[1,2]Department of Orthodontics and Dento facial Orthopaedics, Royal Dental College College, Challisery, Palakkad, Kerala.

[3]White Petals Dental Clinic, Pampakuda, Ernakulam, Kerala

[4]Department of Oral and Maxillofacial Pathology, Malabar Dental College and Research Centre, Edappal

Address for Correspondence: Dr. Akhil S
Chief Dental Surgeon
White Petals Dental Clinic Pampakuda
PO MuvattupuzhaTaluk
Ernakulam dist., Kerala, India-686667.
Email: whitepetalsdentalclinic@gmail.com

Received : 24 July, 2024, **Published :** 31 Dec., 2024

How to cite this article: T, N., NS, S., Akhil S, & KT, H. (2024). Climate change and your smile: unveiling the oral health impacts of global warming- a scoping review. UNIVERSITY JOURNAL OF DENTAL SCIENCES, 10(4).

Inclusion criteria:

- Studies thatexplore the relationship between oral health and climate change or global warming.
- Publications that have undergone peer review, observational studies, and experimental research.
- Investigations using human subjects of different age groups.

Exclusion criteria:

- Articles that neglect the main subject (for example, general effects of climate change that do not address oral health).
- Editorials, opinion pieces, conference abstracts, and nonpeer reviewed publications.
- Studies that were published in languages other than English.
- Research conducted on animals or in laboratories that do not directly affect human health.

Data extraction and synthesis:

Data collection was performed independently by two reviewers. The collected data included the study design, sample size, study characteristics, population characteristics, exposure and outcome measures,specific aspects of global warming/climate change considered and oral health outcomes measured.

Risk of bias assessment:

The risk of bias in the included studies was assessed using the Cochrane Risk of Bias Tool for randomized controlled trials or the Newcastle–Ottawa Scale for observational studies.

Results:

A total of 1,235 publications were selectedfor the scoping review on the effects of global warming on oral health. A total of 980 items were retained for screening after eliminating duplicates. A total of 150 articles were found to be potentially relevant after sorting them based on their titles and abstracts. This was further reduced to 45 articles that met the inclusion criteria by full-text screening. These publications included a range of study designs, such as reviews, case–control studies, cohort studies, and cross-sectional studies (Fig 1). Significant findings from these studies indicated that, especially in susceptible groups such as elderly individuals and children, rising temperatures are associated with an increase in the frequency of periodontal and dental caries. Furthermore, declining oral health is often attributed to changes in environmental variables caused by climate change, such as diet and water quality.

Types of Effects:

Global warming impacts oral health through several mechanisms: direct effects, indirect effects, extreme weather events, and socioeconomic consequences.[3]

Direct effects:

Temperature Extremes:

Increased temperatures have the potential to worsen oral health issues. Through their study, Arendorf TM and Walker DM reported that high temperatures promote the growth of oral infections such as Candida species, which increases the risk of oral candidiasis, especially in those

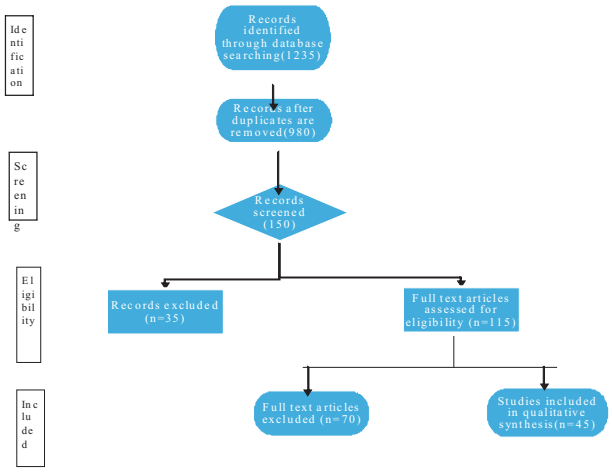

Fig 1 Flowchart of study selection adapted from PRISMA

Withan impaired immune system.[4] Furthermore, excessive heat might have an adverse effect on dental materials, which could retard the integrity of prostheses and dental restorations.[5]

UV radiation:

Higher levels of ultraviolet (UV) radiation are caused by ozone layer thinning, which is partially caused by global warming. This can increase the risk of lip cancer and other oral malignancies. UV exposure alters lip cell DNA, which aids in the development of cancers, such as basal cell carcinoma (BCC).[6]

Indirect effects:

Nutritional Changes:

Global warming has an influence on agriculture and affects the availability and quality of food. This may result in dietary changes that have an impact on dental health or nutritional deficits. For example, consuming fewer fruits and vegetables might increase the risk of dental caries and periodontal disease.[7]

Water scarcity:

Droughts caused by climate change cause a decrease in water availability, which has an impact on dental hygiene. The risk of dental caries can be increased by having limited access to clean water since it can result in worsening oral hygiene habits and a greater dependence on bottled or sweetened drinks.[8]

Extreme Weather Events

Natural Disasters:

Natural catastrophes such as hurricanes, floods, and others cause disruptions to healthcare services, including dental treatment. Oral candidiasis and herpes simplex virus (HSV) infections are two opportunistic lesions that are more common in postdisaster contexts due to poor hygiene, elevated stress levels, and other factors.[9]

Heat waves:

Heat waves have the potential to worsen dehydration and cause xerostomia or dry mouth, which increases the risk of oral infections, periodontal disease, and dental caries.[10]

Socioeconomic impacts

Migration and Displacement:

Migration and relocation caused by climate change frequently result in less accessibility to healthcare services. Oral health may deteriorate in displaced people due to inadequate dental hygiene, restricted fluoride availability, and dietary inadequacies.[11]

Financial Stress

The financial effects of global warming, such as job losses and rising medical expenses, may make receiving dental care more challenging. Walther et al. stated that financial hardships frequently cause dental appointments to be postponed, which worsens oral health conditions.[12]

Effects on the Oral Cavity

Dental Caries

Dietary practices are impacted by global warming, which has an impact on the incidence of dental caries. The risk of dental caries is increased by a greater intake of sugary foods and drinks, which is frequently caused by changes in agricultural production and food costs. Furthermore, a lack offluoridated drinking water can worsen the risk of dental caries.[13]

Periodontal Disease:

Nutritional deficits can worsen periodontal disease, especially in regard to the vitamins and minerals needed for good dental health. Poorer periodontal health outcomes can result from changes in the availability and quality of these nutrients caused by global warming. Furthermore, there is evidence connecting elevated air pollution levels, a consequence of climate change, to an increased risk of periodontal disease.[14]

Oral Cancer:

Oral and lip cancers are more common as a result of higher UV radiation levels caused by global warming. Hernández-Morales A et al.pointed out that UV light damages cell DNA, which accelerates the growth of malignancies. Moreover, climate change-related environmental contaminants, such as polycyclic aromatic hydrocarbons, have carcinogenic qualities that might affect oral tissues.[15]

Dental Infections:

Increased humidity and heat foster the growth of microorganisms such as*Candida albicans* (*C.albicans*), the cause of oral candidiasis. People with impaired immune systems, such as those living with HIV/AIDS, are more susceptible to these illnesses. Moreover, variations in temperature have the potential to modify the prevalence of viral diseases such as HSV, hence increasing the incidence of oral symptoms.[2]

DISCUSSION

Populations at Risk:

The effects of global warming on dental health are more likely to affect some populations than others. These include low-income people, elderly people, and children. Poor oral hygiene and dietary deficits can have long-term effects on the oral health of children, who are especially susceptible to these conditions. Elderly people are more vulnerable to consequences from harsh weather and limited access to healthcare since they frequently have preexisting health concerns. People with low incomes may not have access to sufficient dental care, which increases their susceptibility to the consequences of climate change.[16]

Interventions in Public Health and Policy

Comprehensive public health policies are needed to address the oral health implications of global warming. Oral health promotion and climate change adaptation must be included in policy this comprises Enhancing Dental Care Accessibility: Ensuring public health initiatives and insurance coverage make dental care more accessible to everyone, particularly marginalized groups.[17]

Education and under standing Raising community understanding of the value of good oral hygiene and the effects of climate change on dental health.[2]

Sustainable practices:

Encouraging eco-friendly products and processes as well as waste reduction and other sustainable measures in dentistry.[18]

Research and surveillance:

Strengthening studies on how climate change affects oral health and setting up surveillance networks to track trends and epidemics connected to climate change.[2]

Innovations in Technology:

Technological developments can lessen some of the negative consequences of global warming on dental health. Dental consultations and follow-ups may be accessed remotely thanks to innovations such as tele-dentistry, which is especially helpful in rural or natural disaster zones, as stated by Tella AJ et al.[19] Furthermore, in hotter climates, the creation of heat-resistant dental materials can extend the duration and efficacy of dental treatments.[2]

Global Cooperation:

Worldwide collaboration is necessary to address the worldwide challenge of global warming. To reduce the effects of climate change on human health, nations must collaborate in the development and use of mitigation measures. The World Health Organization (WHO) and other international organizations can play a major role in coordinating efforts and providing recommendations for including oral health in strategies to adapt to climate change.[20]

Conclusion:

There are several direct and indirect ways that global warming puts oral health at risk. The repercussions might include everything from an increase in cancer and oral infections to the exacerbation of illnesses caused by insufficient food and water. Those in low-income groups, elderly individuals, and children are among the most susceptible demographics. To address these concerns, technological improvements, international collaboration, and integrated public health initiatives are needed. As the environment changes, proactive measures must be taken to safeguard oral health, ensuring that dental care systems are strong and open to all people.

References:

1. AR6 Climate Change: The sixth assessment report on climate change. IPCC, Geneva (2021). https://www.ipcc.ch/report/ar6/wg1/
2. Hackley DM. Climate change and oral health. Int Dent J. 2021; 71(3): 173-177.
3. Cianconi P, Betrò S, Janiri L. The impact of climate change on mental health: A systematic descriptive review. Front Psychiatry. 2020; 11:74.
4. Arendorf TM, Walker DM. The prevalence and intraoral distribution of *Candida albicans* in man. Arch Oral Biol. 1980; 25(1):1-10.
5. Bokhari AM, Vinothkumar TS, Albar N et al. Barriers in rubber dam isolation behaviour of dental students during adhesive restorative treatments: A cross-sectional study. Cureus. 2024; 16(4): e58329.
6. Gallagher RP, Lee TK, Bajdik CD, Borugian M. Ultraviolet radiation. Chronic Dis Can. 2010; 29 Suppl 1:51-68.
7. Sheiham A, Watt RG. The common risk factor approach: a rational basis for promoting oral health. Community Dent Oral Epidemiol. 2000; 28(6):399-406.
8. Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century--the approach of the WHO global oral health programme. Community Dent Oral Epidemiol. 2003; Suppl 1: 3-23.
9. Suzuki-Barrera K, Teramoto A, Sáez-Chandía J, Nakakuki K, Bracchiglione J. Oral Health Interventions in Natural Disasters: A Scoping Review. Disaster Med Public Health Prep. 2023; 17:e388
10. Hickson M. Malnutrition and ageing. Postgrad Med J. 2006; 82(963): 2-8.
11. McMichael AJ, Woodruff RE, Hales S. Climate change and human health: present and future risks. Lancet. 2006; 367(9513): 859-69.
12. Walther C, Aarabi G, Valdez R et al. Postponed dental appointments due to costs are associated with increased loneliness-evidence from the survey of health, ageing and retirement in Europe. Int J Environ Res Public Health. 2021; 18(1): 336.
13. Tinanoff N, Baez RJ, Diaz Guillory C et al. Early childhood caries epidemiology, aetiology, risk assessment, societal burden, management, education, and policy: Global perspective. Int J Paediatr Dent. 2019; 29(3): 238-248.
14. Martin N, Sheppard M, Gorasia G, Arora P, Cooper M, Mulligan S. Awareness and barriers to sustainability in dentistry: A scoping review. J Dent. 2021; 112: 103735.
15. Hernández-Morales A, González-López BS, Scougall-Vilchis RJ, et al. Lip and oral cavity cancer incidence and mortality rates associated with smoking and chewing tobacco use and the human development index in 172 countries worldwide: An ecological study 2019-2020. Healthcare (Basel). 2023; 11(8): 1063.
16. Peres MA, Macpherson LMD, Weyant RJ, et al. Oral diseases: a global public health challenge. Lancet. 2019; 394(10194): 249-60.
17. Al-Shehri SAM. Access to dental care for persons with disabilities in Saudi Arabia (caregivers' perspective). J Disabil Oral Health. 2012; 13(2): 51–61.
18. Mittal, Reena; Maheshwari, et al. Eco-Friendly dentistry: preventing pollution to promoting sustainability. Indian J Dent Sci.2020; 12(4): 251-57,

19. Tella AJ, Olanloye OM, Ibiyemi O. Potential of teledentistry in the delivery of oral health services in developing countries. Ann Ib Postgrad Med. 2019; 17(2): 115-23.
20. WHO. COP26. Special report on climate change and health: the health argument for climate action. WHO; Geneva, Switzerland: 2021. [(accessed on 30 April 2024)]. pp. 1–71. Available online: https://apps.who.int/iris/handle/10665/346168.