

# Paediatric oral health and climate change

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Globally, the health of many children is being affected by the current climatic changes taking place. It is expected that oral health will undergo through the similar changes, requiring solutions by the paediatric dentists. Children are most affected with climatic changes because of the rapid changes in their life cycles of growth and development that takes place.

Due to the present anthropogenic activities, the earth's atmosphere has continued to be polluted with carbon dioxide emissions and other green house gases resulting from these activities, the outcome of which are extreme weather changes, referred to as "global warming". This is the phenomenon where temperatures continue to increase with associated higher evaporation rate, storms and other climatic changes. The United Nations Framework Convention on Climate Change (UNFCCC) has defined this phenomenon as "a type of climate change resulting from direct or indirect human activities that lead to alteration in the composition of global atmosphere, and this in turn leads to the changes observed in the environment". The most common human activities that have been associated with climate change are the use of fossil fuels, solid waste management, trees and wood products, methane from oils, coal, natural gas and municipal waste that have led to enormous increase in carbon dioxide emission. These activities are in addition to the agricultural and industrial activities that results in increased production of Nitrous Oxide, fluoridated gases like hydrocarbons, perfluorocarbons, sulphur hexafluoride, that have effect on depletion of Ozone layer in the atmosphere. As the levels of these activities increase, more infrared light is tending to be absorbed, thus trapping more heat in the atmosphere and exacerbating the situation [1].

As a direct effect, all children are being exposed to the changing weather patterns and temperature, with net effects on their health. An indirect effect of the climate

change comes in the form of changes in the quality of water, air, food and the economy of the child's caregiver. These changes are in turn, slowly affecting the quality of life of children, leading to their vulnerability to new diseases, like cancers, interruptions in growth and development etc. It is not difficult to fathom the changes in the oral health associated with these climatic changes, for example, oral cancers, increasing cases of dental developmental defects (DDE), changes in the pattern of early childhood dental caries, with associated periodontal disease.

The increasing carbon dioxide in the atmosphere results in increased water acidification, which in turn produces changes in the integrity of soils, diminishes food sources, increases poverty due to lack of economic opportunities [2]. The changes in the quality of water acidity will increase cases of dental erosion in these children. The diminished food sources will lead to increased malnutrition, poor general and dental growth and development, poor general health, hence increased susceptibility to caries and periodontal disease.

The Paris agreement to mitigate climate change and increase the use of renewable energy and green-house gas removal (GGR) technologies was mooted, but whereas all countries agreed and signed to this agreement, US is the only country that has not signed. Yet, US is a big emitter of green-house gases, and if the continued inability for the world to mitigate the changes taking place in the environment continues, the climatic change- associated diseases, cancers etc will also continue to present challenges to the social status of vulnerable children from poor nations, who do not even have access to proper medical or oral healthcare [3].

In 2018, many countries experienced high temperatures for their summer season, and very low temperatures for their winters. No doubt that these extreme temperatures will have effects to the daily quality of life of many children. The low temperatures results in respiratory diseases associated with the children staying for long periods in poorly aerated rooms. This has the potential to result in a rise in developmental defects of enamel. On the other hand, the high temperatures are likely to result in increased wild fires, dust, smoke, lead to many children being affected by upper respiratory diseases, with ramifying effects in the oral cavity. In Portugal and Spain, temperatures rose in August to 46°C or 114.8°F and were expected to rise to 46.9°C or 116.4°F,

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compared to its highest ever-recorded in 2003 of 47.4°C or 117.3°F [4]. This increase was associated with an influx of hot air from Africa, and with it loads of dust from the Sahara desert. The resultant effects of this phenomenon are heat waves that have been associated with health issues in the children.

Poor quality of air has also been associated with premature death, cancer and long-term effects on the respiratory and cardiovascular systems. For example, nitrogen has been associated with wheezing and exacerbates asthma. Sulphur dioxide also causes wheezing and exacerbates chronic pulmonary diseases as well as cardiovascular diseases. There is evidence from the epidemiologic data on the relation of prenatal air pollution exposure and the risk of oral cleft.

The depletion in fresh water resources associated with the global warming could also be a health threat due to increasing water contamination. Chemicals in water, whether naturally occurring or introduced by human activities, can have huge impact on teeth and oral mucosa of a child. For example, lead in water can be poisonous to children, and excess ingestion of this metal by children can cause encephalitis, behavior disorders, inattention, reduced nerve conduction and IQ deficit [5, 6]. Further, water with high quantities of fluoride can lead to skeletal and dental fluorosis. Fluoride exposure most often comes through drinking water, but some coal contains high levels of fluoride, which can lead to additional exposure. Higher levels of fluoride can have adverse effects on health of a child. Children are the most susceptible to fluoride poisoning. It can lead to opaque white lesions on their teeth at low levels, while discolored and damaged teeth can occur at higher levels.

Arsenic or phosphorus from fertilizer can have adverse effects on the oral health of children when ingested in high quantities, with effects on the skin, tongue, gingiva and buccal mucosa. Arsenic – diffuse macular pigmentation, palmar and plantar hyperkeratosis, pre-malignant lesion - arsenical keratosis that can transform to basal cell carcinoma and cutaneous squamous cell carcinoma and excessive salivation [6].

Various oral diseases in children, for example dental caries, fluorosis are influenced by the food and water consumed by children in a particular topographic area. Although fluoride is introduced into some water supplies for its protective effect on tooth enamel, excess of fluoride can lead to tooth and bone damage, in the form of fluorosis of the tooth or bone.

**CONCLUSION**

The future of oral health of children appear to be in jeopardy in the face of the current climatic changes taking place, and paediatric dentists need to take cognizant of this fact and begin to mitigate the envisaged dental effects in children.

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**Keywords: Climate change, Environmental contamination, Global warming, Paediatric oral health**

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**Author Contributions**

Arthur Musakulu Kemoli – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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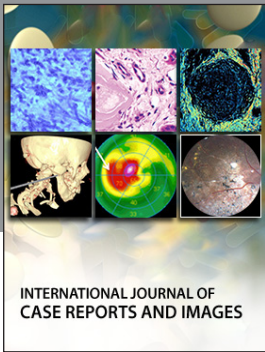
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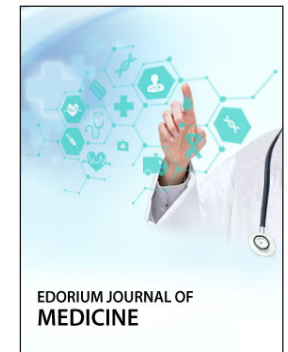
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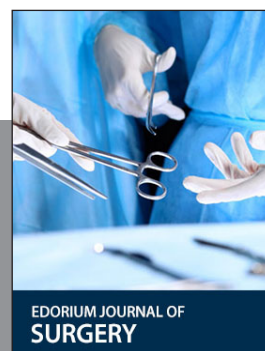
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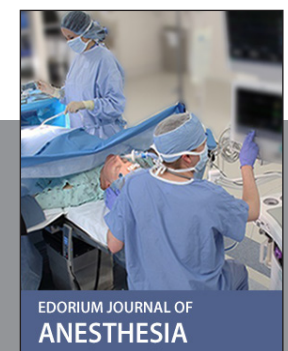
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