

*Full Length Research Paper*

# Global warming: Implications for nursing

Ojewale, Lucia Yetunde and Oyetunde, Modupe Olusola\*

Department of Nursing, University of Ibadan, Ibadan, Nigeria.

Accepted 4 May, 2012

**The environment plays a significant part in human development, human health and diseases. Over the years, the environment has been progressively harsh, due to global warming (GW). The increase in the production of green house gases has resulted in enhanced greenhouse effect which has also resulted in changing epidemiological pattern of diseases. Nursing, being a responsive profession is not immune to the effects of global warming. This paper attempts an exploration of effects of global warming with a view of elucidating its implications for nursing. The concept of global warming was reviewed, various climatic changes were presented and the implications for nursing were brought to the fore. Nursing curricula should therefore be tailored and expanded to accommodate the various changes that occur as a result of global warming. Nurses are enjoined to be more proactive in the management of the increasing natural disasters and outbreak of communicable diseases.**

**Key words:** Global warming, greenhouse effects, disease-pattern, vulnerable group, nursing.

## INTRODUCTION

Over the last 100 years, there has been an increase in the temperature of the earth (Walther et al., 2002). Between 1906 and 2005, the global temperature increased by 0.74°C (Odjugo, 2011; IPCC 2007). Annually, about 300,000 deaths occur, and by 2030 half a million individuals could die every year as a result of the climatic change (Annan, 2009). The earth's temperature is increasing at a rate twice as fast as has been noted for any period in the last 1,000 years (PEW, 2007). Global warming is closely linked to carbon dioxide (CO<sub>2</sub>) emission. There has been a rise in CO<sub>2</sub> emission of 130-fold since 1850, from 200 million tons to 27 billion tons a year. Moreover, CO<sub>2</sub> is projected to rise another 60% by 2030 (Stott et al., 2004). Evidence abound that global warming, which is one of the causes of global climate change, is already affecting human life (Oreskes, 2004).

In nursing, the interplay of nature – nurture in human development, wellness and illness continuum is well studied and documented. The environment constitutes a critical factor in human health and experience. Any changes in the environment automatically result in changes in the health status of the people. Nursing provides preventive, promotive, curative, as well as

restorative care to individuals and families, all of which have considerations for the environment. The effect of global warming is thus becoming a challenge to nursing and it is better discussed in order to forestall a more pragmatic measure to combat the unwanted effects of global warming (GW).

## GLOBAL WARMING AND THE GREEN HOUSE EFFECT

Global warming as an increase in the world's temperatures is believed to be caused in part by the greenhouse effect (Spencer, 2008). The greenhouse effect is the process by which absorption and emission of infrared radiation by gases in the atmosphere warm a planet's lower atmosphere and surface. According to Spencer (2008; as cited by Odjugo [2011]), green house effect was proposed by Joseph Fourier in 1824 and was first investigated quantitatively by Svante Arrhenius in 1896. Some green house effect is necessary for human life; otherwise the earth will be too cold for survival. The increased concentration of these gases act like the glass covering a greenhouse; which lets sunlight in, but blocks some of the infrared radiation from the earth's surface that carries heat back into space. Presently, the earth is experiencing an enhanced greenhouse effect related to

---

\*Corresponding author. E-mail: [dusoyet@yahoo.com](mailto:dusoyet@yahoo.com).

human activities, such as transportation which is closely linked with CO<sub>2</sub> emission (Odjugo, 2007). In Nigeria, automobiles are the major sources of air pollution in the urban areas. In a resource poor country like Nigeria, motorcycle is a major means of intra-city transportation. Most vehicles imported into the country are either fairly used or old ones, which emit lots of carbons into the atmosphere. In addition, carbon emission from motorcycles is worse than those from vehicles. Most commercial motorcycle riders in Nigeria usually add engine oil to the petrol surface. This automatically turns the petrol into gasoline. Although gasoline burns slower than petrol, it emits more carbon. Thus, the motorcycle riders save fuel at the expense of the environment (Odjugo, 2007). Similarly, epileptic power supply has resulted in majority of people buying generators to provide individual thermal electricity. This not only constitutes noise pollution but also emits a lot of carbons into the atmosphere (Odjugo, 2007).

Gas flaring is also another source of green house gases emission especially in Nigeria which is the largest gas flaring nation in the world; she flares more than 70% of her natural gas (Houghton, 2004). Gas flaring is a by-product of oil drilling. It has been documented that there was a 70% increase in the concentration of greenhouse gases (GHG) in the atmosphere between 1970 and 2004. This increase has two main implications: (1) depletion of the ozone layer, thereby allowing more solar radiation into the earth's surface; (2) trapping of the outgoing heat from the earth's surface causing an increase in the Earth's temperature, Houghton (2004). GW contributes to changes in climate such as extreme weather conditions.

## EVIDENCE OF GLOBAL WARMING

In Alaska, there is evidence of glacier melting. In Nigeria, the mean temperature between 1901 and 1938 was 26.04°C, while the mean between 1971 and 2008 was 27.83. This indicates a mean increase of 1.78°C for the two climatic periods. If this drift continues unattended to, Nigeria may experience between the middle (2.5°C) and high (4.5°C) risk temperature increase by the year 2100. It also shows that Nigeria is experiencing GW at a rate higher than the global one, (Odjugo, 2007).

## Physical consequences of global warming

Global warming can lead to changes in rainfall patterns and a rise in sea level. This can have lasting impact on plants, wildlife and humans in diverse ways. Most climate models indicate that in many places, global warming is likely to increase the frequency and duration of extreme events such as heavy rains, droughts, and river- floods, heat waves and extreme cold, hurricanes, soil erosion and desertification, landslides and mud slides (UNU-

EHS, 2007).

## Effects of global warming on health

In 2003, Europe experienced its hottest summer in centuries, with temperatures averaging 3.5°C above normal. Over 22,000 individuals throughout Europe died during or directly after the summer heat wave of 2003 (Louisiana Department of Health and Hospitals, 2006). The United State of America was not left out in this experience. For example, in the summer of 2005, the US Hurricane Katrina occurred and was one of the deadliest hurricanes in U.S history. In Louisiana alone, 1,464 people lost their lives and over 135 were reported missing (Afzal, 2007). Reports about the New Orleans storm in the US gave details about the aftermaths. Thousands of individuals and families were displaced and crowded into shelters; floodwaters were contaminated with sewage, and there was a lack of food and portable water which created concerns about the possibility of a communicable disease outbreak (Bell et al., 2006).

In addition, the changes to air quality associated with GW result in the formation of ground level ozone due to a combination of high temperatures, sunlight and certain air emitted from motor vehicles, power plants, and other sources of combustion. The higher the temperature and the more direct the sunlight, the more ozone is produced. Sadly enough, exposure to ozone is associated with increased risk of premature mortality. In fact, there is an increased risk of premature mortality even at low levels of ozone (Epstein, 2000). There is also a concern that as temperatures rise, there may be a rise in vector-transmitted diseases, such as malaria, West Nile virus, and dengue fever; and insects that transmit these diseases will mature faster, lay more eggs, and bite more frequently (Reiter, 2001; WHO, 2006). In a similar way, the World Health Organization has identified more than 30 new or resurgent diseases in the last three decades, and changing patterns in distribution of malaria, West Nile virus, tick-borne encephalitis (TBE), dengue fever, cholera and Lyme disease, (Hunt, 2007) to mention just a few. According to Hunt (2007), malaria now kills 3,000 African children a day - a dramatic increase from the 1950s and '60s, when control and containment seemed possible. By the end 21st century, warming will enlarge the zone of potential malaria transmission from an area containing 45% of the world's population to an area containing about 60%. No vaccine is available, and the causative parasites are becoming resistant to standard drugs. The geographic range of malaria is generally limited to the tropics and subtropics because the *Plasmodium* parasite requires an average temperature above 16°C to develop. A report stated that warming had caused malaria to spread from three districts in western Kenya to thirteen and led to epidemics of the disease in Rwanda and Tanzania. Europe may be affected in future

as Turkey is already a danger zone for malaria. The WHO says it is likely to spread within Eastern Europe, and from there, possibly to Western areas (McMichael et al., 2006).

There have been reports about changes in the epidemiology of cholera as a result of climate change and global warming facilitated by poverty and poor public health. It swept from Peru across the continent and into Mexico, killing more than 10,000 people. *Vibrio cholerae* has also been found to be associated with marine zooplankton and blooms from warmer sea surface. Temperatures could expand this reservoir of cholera epidemics. Increased floods and droughts will increase cholera outbreaks because droughts can wipe out supplies of safe drinking water and concentrate contaminants that might otherwise remain dilute (McMichael et al., 2006). For example, the 2006 cholera outbreaks in Bangladesh was brought about by heavy rains (Longstreth, 2001)

The impact of extreme weather events around the globe has already created millions of environmental refugees (Relief web, 2011). These refugees have been displaced from their homes and countries due to sudden extreme weather changes, including increase in desert area, diminishing water supplies, and rising sea levels. Since the beginning of 2011 for instance, the horn of Africa (Somalia) has been experiencing drought leading to food shortage, thus the country has the greatest number of refugees in the world (Kosatsky, 2005). Moreover, drought contributes to famines and disease outbreaks in less developed countries that kill millions of people. Nigeria is not left out in this experience as many lives have been lost due to heavy rainfall and storm accompanied by flood.

## EFFECT ON THE VULNERABLE GROUP

Extreme weather events increase the death rates of the elderly and the very young as it causes changes in air and water quality and changes in the ecology of infectious diseases (Longstreth, 2001). Children are especially vulnerable since they may not have fully developed immune or heat-regulatory systems, because they breathe more air per kilogram than adults, and because they are more likely to play outside. The elderly are also at risk from extreme weather events which may result in falls, especially during evacuations; and they are more vulnerable to heat-related illnesses.

Chronically ill people, such as persons with pre-existing heart or lung conditions, are at risk of illness or death from heat and air pollution. People with heart problems are vulnerable because their cardiovascular system must work harder to keep the body cool during hot weather. In addition, heat exhaustion and some respiratory problems increase. Higher air temperatures also increase the concentration of ozone at ground level. Ozone damages lung

tissues and causes particular problems for people with asthma and other lung diseases (McMichael et al., 2006). Immuno-compromised individuals are at higher risk of infectious diseases spread by contaminated food or water. The urban poor are also vulnerable because urban environments trap heat. Many of the urban poor may not have access to air conditioning or to cooled public spaces; they do not have the resources to be able to seek early or preventative health care.

## IMPLICATIONS FOR NURSING

### Increased workload and expanded role

Due to the consequences of global warming on health, nursing resources will be severely stressed in many places all over the world since more people may require hospitalization. Places like sub-Saharan Africa where limited resources are made available for health care might be more affected. Despite the nursing shortage all over the world, nurses will still migrate from poor - resource countries to richer countries leaving their home countries deficient of nursing manpower. Nurses will have to work hard to prevent outbreak of epidemic diseases through strict adherence to professional standard, patient teaching and health education on personal and environmental hygiene. Advocacy can help in ensuring proper waste disposal. The government can also be encouraged to provide adequate water supply so as to prevent communicable disease outbreak. Nurses will also be needed to care for refugees and displaced people, thus need to develop competencies in refugee management. Generally, nurses will need to mount an effective public health response because of the consequences of the extreme weather condition.

### Curricular issues

Specific health problem of refugees will have to be studied, indicating a need for curricular revision that is able to prepare climatologically responsive nurses. Nurses all over the world also need to respond to the new disease patterns, including increase in the prevalence of diseases like malaria, incidence of cholera and exacerbation of chronic diseases of the heart and lungs. Skills in emergency and disaster management, and management of refugees and other related issues will need to be included in the nursing curricular.

### Research

Nurses will need to improve and be more committed to research in order to develop a sound knowledge base for nursing care. The need to generate evidence for best

practice can be best achieved with research. This is imperative as health care cost continues to escalate. They could also collaborate with other researchers to solve some of the problems of GW. Grant proposal writing skill should be acquired as this would be beneficial in reducing to financial hardship of research.

### Advocacy

Nurses also need to be at the forefront of advocacy because non-health professionals including politicians may not understand the consequences of continuous increase in CO<sub>2</sub> emission. For instance, when the Maryland Nurses Association proposed the implementation of the 2006 Healthy Air Act, the legislators did not agree initially. The nurses realized that the legislators did not understand the effect of carbon dioxide pollution. The nurses then worked with environmental organizations to educate legislators on the causes, public health impacts, and solutions to the problems caused by greenhouse gas pollution.

### Finance

Public sector finances are likely to be put under strain as a result of having to put up infrastructures to mitigate the effect of extreme weather conditions. Thus, revenue allocation to health may be cut down. This may lead to improvisation in health care or possible compromise in quality care. An understanding of reduced revenue allocation may help the nurses to restructure care while still maintaining quality.

### CONCLUSION AND RECOMMENDATIONS

It is essential that nurses all over the world understand the effects of global warming and promote policies and actions which will reduce the process of global warming. This article has given a brief overview of global warming, discussed its causes and effects, considered the health problems associated, and reviewed individual and joint efforts aimed at reducing global warming. The implications for nursing were also highlighted and discussed. It is hoped that this article will help nurses and other health care providers reduce the negative effects of global warming and thereby improve the health of all people.

In view of the above, the following recommendations are proposed: In the workplace nurses can strive to reduce, reuse, and recycle in order to decrease the health care impact on the environment. Nurses can also promote the safest, most advanced methods of waste disposal, never opting for incineration (burning), which is a polluting and outdated method of waste disposal. Nurses should embark on public health education. This would have a far reaching effect, because information

from nurses is perceived as credible and compelling since nursing is a very trusted profession. Nurses should support calls for adequately funded research on the public health and disease impacts of global warming. Nurses should participate in research and draw up publicly available policy documents on the long term assessment of the impact of climate change on the need for nursing care and on the nursing profession. Nurses should encourage governments and international agencies to act now to mitigate the impact of industrial and economic policy on the environment. And finally, nurses should also urge all bodies involved in nursing education to put 'climate change and health' in the curriculum, especially at the higher level

### REFERENCES

- Afzal BM (2007). Global warming: A Public Health concern OJIN: The Online J. Issues in Nursing Article published May 31,
- Annan KA(2009) Think-tank <http://www.guardian.co.uk/environment/may/29/>
- Bell ML, Peng RD, Dominici D (2006). The exposure-response curve for ozone and risk of mortality and the adequacy of current ozone regulations. *Environmental Health Perspectives*, 114(4). Retrieved January 27, 2007 from <http://www.ehponline.org/members/2006/8816/8816.html>
- Epstein PR (2000). Is global warming harmful to health? *Scientific America*. Retrieved May2,2007,from <http://chge.med.harvard.edu/publications/journals/documents/sciam.pdf>.
- Houghton J (2004) *Global Warming: The Complete Briefing*. Cambridge University Press, 3rd edn.,
- Hunt G (2007). Global warming and the future of health care and nursing At The Royal College of Nursing Annual Congress, Mary Seacole Memorial Lecture, Harrogate 18th April
- Hunt G. (2007) 'Global Warming and the Future of Nursing and Health Care Profession' Intergovernmental Panel on Climate (IPCC) 2007. The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>. Retrieved, 2009-07-03
- Kosatsky T (2005). The 2003 European heat waves. *Euro surveillance*, 10(7): 148-149.
- Longstreth J (2001). Public health consequences of global climate change in the United States and some regions may suffer disproportionately. *Environmental Health Perspectives*, 107(1): 169-79.
- Louisiana Department of Health and Hospitals. (2006). Hurricane Katrina deceased reports. Retrieved April 15, 2007 from [www.dhh.louisiana.gov/offices/page.asp?ID=192&Detail=5248](http://www.dhh.louisiana.gov/offices/page.asp?ID=192&Detail=5248)
- McMichael AJ, Woodruff RE, Hales S (2006). Climate change and human health: present and future risks. *The Lancet* 367:859-869
- Odjugo PAO (2011). An analysis of rainfall pattern in Nigeria. *Global J. Environmental Sci.*, 4(2): 139-145
- Odjugo PAO (2007). Some effects of gas flaring on the microclimate of yam and cassava production in Erhorike and Environs, Delta State, Nigeria. *Nigerian Geographical J.*, 5(1): 43-54.
- Oreskes N (2004). "BEYOND THE IVORY TOWER: The Scientific Consensus on Climate Change". *Sci.*, 306 (5702): 1686
- Pew Center on Climate Change (PEW). (n.d. [a]). Climate change 101: The science and impacts. Retrieved January 29, 2007, from [www.pewclimate.org/docUploads/101%5FScience%5FImpacts%2Epdf](http://www.pewclimate.org/docUploads/101%5FScience%5FImpacts%2Epdf)
- Reiter P (2001). Climate change and mosquito-born disease. Retrieved January 29, 2007 from [www.ehponline.org/members/2001/suppl-1/141-161reiter/reiter-full.html](http://www.ehponline.org/members/2001/suppl-1/141-161reiter/reiter-full.html) [reliefweb.int/horn-africacrisis2011?sl=environment-term](http://reliefweb.int/horn-africacrisis2011?sl=environment-term),

- Spencer RW, (2008). "The Carbon Dioxide Greenhouse Effect". The Discovery of Global Warming. American Institute of Physics. <http://www.aip.org/history/climate/co2.htm>. Retrieved, 21 April 2009.
- Stott PA, Stone DA, Allen MR (2004). Human contribution to the European heat wave of 2003. *Nature*, 432: 610-614.
- UNU-EHS (2007). As ranks of "environmental refugees" swell worldwide, calls grow for better definition, recognition, support. Retrieved April 11, from [www.ehs.unu.edu/article:130](http://www.ehs.unu.edu/article:130)
- Walther GR, Post E, Convey P, Menzel A, Parmesan C, Beebee TJ, et al. (2002). Ecological response to recent climate change. *Nature*, 416: 389-395
- WHO (2006) Climate Change and Health. Available at: <http://www.who.int/globalchange/climate/en/>