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Climate Change and Children; Impact on Health and Wellbeing – A Comprehensive Overview

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ABSTRACT *Recent demographic trend reveals that children below the age of 18 years account for a sizeable number of 2.2 billion in the population, but unfortunately it is estimated that 36% of the deaths occur amongst children younger than 14 years, attributed to illnesses arising from rapid climatic changes and poor environmental conditions. Review of literature indicates that children are amongst the most vulnerable segment and among the worst sufferers in terms of health and wellbeing in response to climatic changes such as increased temperature, precipitation, flooding, natural disasters, poor air quality etc. due to they being relatively immature in terms of their physical, cognitive and emotional development in comparison to their adult counterparts. This increases their susceptibility to a wide array of communicable and infectious diseases, disability, injury proneness and at times even death; adversely affecting their otherwise consequential and productive health and wellbeing. The present paper attempts to highlight and discuss the impact of climate change on the health and wellbeing of children and the role of psychologists in helping in bringing about improved approaches to changing environmentally significant behavior.*

"The long-term good health of populations depends on the continued stability and functioning of the biosphere's ecological and physical system, often referred to as life-support systems. We ignore this long established historical truth at our peril: yet it is all too easy to overlook this dependency, particularly at a time when the human species is becoming increasingly urbanized and distanced from these natural systems. The World's climate is an integral part of this complex of life-supporting processes, one of many large natural systems that are now coming under pressure from the increasing weight of human numbers and economic activities" (Mc Michael, 2003).

The Earth is getting warm; the entire climatic pattern across the globe is undergoing transformation in consequence to an unprecedented rise in human activities and rapid industrialization that have produced increases in climate forcing factors, chiefly greenhouse gases (GH.G) and land cover changes that alter the Earth's albedo, or reflectivity of energy coming from the sun. The important greenhouse gases are Carbon-di-Oxide (from fossil fuels, manufacturing, deforestation & decaying vegetation), Methane (from production & transport of fossil fuels, livestock, agricultural practices, solid-waste landfills), Nitrous Oxide (from agricultural & industrial activities, combustion of fossil fuels, solid wastes & fluorinated gases) (U.S. Environmental Protection Agency, 2009). Furthermore, IPCC (2007) estimated that the global mean temperature at the end of the 21st century would be between 0.3 and 6.4 degrees Celsius, higher than the 1980-1999 conditions. Studies conducted across the globe indicate that these climatic changes and the one's in consequence to natural and technological disasters have found to have critical impact on the mental health of victims, including acute P.T.S.D and other stress-related problems such as grief, depression, anxiety disorders, somatoform disorders, and drug and alcohol abuse, higher rates of suicide attempts and completions; elevated risk of child abuse : and increased vulnerability to those with pre-existing severe mental health issues (Fritze, et.al, 2008).

The UNICEF policy review paper on Climate Change and Children (2008) indicates that climate change such as incremental ecosystems deterioration, will lead to long-term drought conditions in many regions, adding stress to and exacerbating the existing untenable conditions facing the most marginalized children. The report further documents that melting of glaciers that supply freshwater to large population centers, sea-level rise leading to saline intrusion into sources of freshwater for agriculture and drinking, changes in the spectrum of vector-borne diseases and increasing air pollution. Furthermore, the sudden onset of disaster can shatter the world of a child in a matter of moments, destroying familiar surroundings and resulting in injuries, under-nutrition or disease in the aftermath. Children may become orphaned or separated from their families, and may be preyed upon by opportunistic adults. These act as a breeding ground for threatening children's health, quality of life, access to education and over-all development beyond repair (Adapted from Climate Change and Children, UNICEF, 2008).

Recent demographic statistics reveal that the world's population is young, with some 2.2 billion people under the age of 18 years. Furthermore, over 1.2 billion people in the world are 9 years old or younger; of these 625 million are under the age of five; over 1.2 billion people are adolescents (between 10-19 years) and about 85 % of the world's youth live in developing countries (Climate Change and Children, UNICEF, 2008).

Taking the above scenario into consideration the present paper attempts to highlight and discuss:

Firstly, the impact and effects of climate change on the health and wellbeing of children.

Secondly, the role and contribution of psychology/psychologists in bringing about improved approaches to changing environmentally significant behavior before and/or amidst such crisis (With special reference to the guidelines recommended by the APA Task Force on the Interface between Psychology and Global Climate Change, 2011).

Impact/Effects of Climate- Change on the Health and Well-being of Children

"We recognize that a growing number of diseases in children have been linked to environmental exposures….that environmental exposures are increasing in many countries…the new emerging risks are being identified, and that more children are exposed to unsafe environments" (The Bangkok Statement, W.H.O, 2002a).

Globally, the per capita number of healthy life years lost to environmental risk factors was about five-fold greater in children under five-fold greater in children under five years of age than in the total population. The difference was even greater (Seven to 10-fold greater) for major diseases, such

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as upper and lower respiratory infections, diarrhea, malaria and malnutrition…. Although these statistics are alarming, they do not capture the longer-term effects of exposures that occur at a young age, but do not manifest themselves as disease until years after exposure (Pruss- Ustin & Corvalan, 2006)

It is estimated that 36% deaths in children younger than 14 years is attributed to illness and conditions related to poor environments (Climate Change and Children, UNICEF, 2008). Review of literature indicates that while determining the most vulnerable group to the psycho-social impact of climate change, children form a sizeable segment. Furthermore, compared to their adult counterparts they are more susceptible to the adverse effects of environmental degradation such as poor air quality, contaminated water and extreme heat as a result of their physical, cognitive and physiological immaturity (Mathieu-Nolf, 2002). Research further concludes that among them, growing children are particularly at a greater risk to such environmental hazards due to their physical characteristics, childhood activities and natural curiosity- as the quality of a child's environment is the key determinant of whether a child would survive the first year of life and in consequence to that would depend his/her future physical and mental development (Kempe, 2005). Furthermore, by virtue of their early stage in development, children and especially young children are at the greatest risk of injury, disability and death from the consequences of the changing climate system. They are less equipped physically, mentally and emotionally to cope with life-threatening conditions combined with the dependence on others for sustenance, nurturing, protection from infection and physical harm, the susceptibility of children to threats is therefore increasing (Bartlet, 2009).

Studies comprehensively conclude that some of the most likely impacts of climate change on the health and wellbeing of children include:

- Increased risk of diarrheal disease, due to flooding and a lack of clean fresh water.
- Induction/exacerbation of allergic disorders.
- Malnutrition and stunting in food-insecure populations, as a consequence of climatic impacts on regional food production.
- Vector-borne infectious diseases such as malaria that particularly endanger children.
- Heightened child susceptibility to thermal extremes; infant death rates go up during these times.
- The usual health hazards of population displacement, with special additional consequences for children because of the description of family and community social networks (Mc Michael, 2002).

Furthermore, it was witnessed that in March, 2002 alone there was a 35-40% increase in infant under-five child mortality in duzd-affected areas; the causes of death being the result of active respiratory infections, malnutrition, exposure to poor heating, inadequate food and water supplies and poor sanitation and shelter. Besides this, the snowfall limited families' ability to access food, fuel and medical services due to poor road access and infrastructure exacerbated the situation. Other than this, the most widely studied effect of thermal stress to health related to heat stress, though mortality rates increased at both high and low extremes of temperature (Curriero, et. al, 2002).

This part of the discussion aims at providing a comprehensive review of literature pertaining to the potentially harmful effects of the changing climatic patterns on the health and wellbeing of children.

❖ **Rising Sea Level, Flooding & Drought**

Studies indicate that in consequence to rapid increase in sea level and shrinking glaciers a sizeable number of children are falling aprey to water-borne diseases. These diseases induce diarrhea and vomiting, which cause children to become dehydrated more quickly than adults, as children's bodies take a longer time to rehydrate than their adult counter-parts. Furthermore, children living in substandard housing on low floodplains are at a high risk of drowning, since they are less likely to be able to swim and are dependent on adults during emergency. The 2003 Bangladesh Health Survey of more than 171,000 households established that drowning is the single leading cause of death among children aged, 1-18 years; having overtaken pneumonia and diarrhea. Further, 17,000 children in Bangladesh drown each year, and about four times as many over 68,000 of them nearly drown (Rahman, et. al, 2005).

In another such case, flood related fatalities in the Sarlahi district of Nepal indicate that children were six times higher than mortality rates in the same village before the floods. Flood rates were 13.3/1000 for girls, 9.4/1000 for boys, 6.1/1000 for women and 4.1/1000 for men; among whom children particularly girls were at the highest risk and children between 2-9 years were twice as likely to die as their same sex-parent (Pradhan, et.al, 2007). These are further associated with increase in number of communicable diseases caused by ingestion of contaminated water (cholera & hepatitis A) or contact with contaminated water (leptospirosis) (Patz & Khaliq, 2002). Furthermore, after floods in Mumbai in 2000, 2001 and 2005, a dramatic rise in the incidence of leptospirosis (as much as eight fold) was observed. Such an alarming outbreak were associated primarily with children playing in flood water or wading to get to school (Kovats & Akhtar, 2008).

Drought has shown to have a significant impact on the health and wellbeing of children. Research in Zimbabwe found significant impacts of children's growth following a drought. Children who were in the critical 12-24 month age group at the time of drought in the early 1980's were found 13-16 years later to have had an average loss of stature of 2.3 inches. (Alderman, et.al, 2004)

❖ **Malnutrition and Under-nutrition**

Nutrition is one of the most significant factors determining risks to health of a child. Its importance extends beyond ensuring survival of an individual. Nutrition provides the source from which future social and economic opportunities flow for generations to come. Despite universal understanding of minimum daily food requirements for survival the importance of breast feeding and micro-nutrient needs for growth, under nutrition still contributes to at least 3.5 million deaths each year and more than one-third of all deaths of children under five years (W.H.O, 2008).

Studies indicate that undernourishment in children caused as a result of changes in climate such as losses in biodiversity, desertification and deforestation act as a precursor to them being prone to a number of other diseases and illnesses. Furthermore, it is indicated that the nutritional status of children is closely related to their vulnerability to malaria, and malaria causes an estimated 1 million deaths each year, and around 80% of these are among children under five years. In Sub-Saharan Africa alone, more than 2000 children under five die each day from malaria. These are a result of children being exposed to such highly sensitive climatic conditions (Climate Change and Children, UNICEF, 2008). Furthermore, forecasts indicate that hunger will affect an additional 40-300 million people by 2060 due to climate change (Parry & Rosenweig, 1993) and since children require 3-4 times more food/unit mass than adults, the majority of this hungry population would be children (United States Environmental Protection Agency, 2002) making it an even bigger challenge to accomplish.

❖ **Vector- Borne Diseases**

Change in climatic patterns is causing a rise in temperature and precipitation acting as a breeding ground for vector-borne diseases such as malaria, dengue and the like. It is indicated that approximately one-quarter of the global burden of disease (GBD) can be attributed to environmental risk factors. More than 40% of the burden falls on children younger than five years (W.H.O, 2002a). Among which estimated

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1.7 million children die each year because of unsafe water, poor sanitation and hygiene; 9/10 th of these deaths occur in children, primarily through infectious diarrhea. Of this, 1.7 million, 1/3rd of the deaths occur in countries in S.E. Asia that have high child-mortality rates and2.7% of the GBD is attributed to indoor smoke. Further, 37% of the total burden occurs in countries in S.E. Asia that have high child-mortality and 16% occurs in western Pacific countries that have low child-mortality (W.H.O, 2002b).

It is indicated that children are particularly susceptible to mosquito and tick bites because they play outside and are closer to the ground, where these vectors gather, making children of 5- 10 years of age twice the incidence among older children and adults (Shapiro, 2000). This also makes them more vulnerable to malaria, insect – borne encephalitis and lyme disease. Furthermore, of all the ages, malaria primarily kills children between 3 months-5years of age because they have little specific immunity. They experience yearly attacks of debilitating, potentially fatal disease. Children are also more susceptible to secondary hypoglycemia and cerebral malaria, which can lead to mortality and neurologic sequelae (Krause, 2000).

❖ **Air Pollutants and Air Borne- Diseases**

Air pollutants such as smoke, dust, harmful pesticides and UV radiation are major contributors in adversely affecting the health and wellbeing of children. It is estimated that 2.1 million children under the age of five die from acute respiratory illnesses worldwide. The case being worst in homes of the poor where there is not enough ventilation and smoky conditions exist and children being exposed to poor air conditions for long hours and among children exercising in high altitude environments, making them prone to a 40% increased risk of developing asthma (Cited in Climate Change and Children, UNICEF, 2008). These being attributed to the fact that children have narrower airways that result in more tissues exposure/volume inhaled and more inflammation. Further, exercise increases breathing through the mouth, rather than the nose which filters approximately half of the pollutants. Polluted air hence, goes straight to the lungs, increasing parenchymal damage. Because children's respiratory systems are still developing and because they have less awareness than adults and continue to chronic (Adapted from American Lung Association, 1999).

Besides this, ozone depletion is leading to greater UV exposure, sunburn and immune-suppression. Since children's skin burns more easily than adults, childhood sunburns significantly increase their risk of developing malignant melanoma later in life (Fitzpatrick, 1996). Studies indicate that many parts of the world including India, have shown a significantly high incidence of abortion, childhood cancers, undescended testicles, and congenital malformations in children of parents occupationally exposed to pesticides. However, controlled use and total avoidance of exposure to pesticides during pregnancy may help minimize exposure related health problems (Saiyed, 2002). Furthermore, various factors related to climate change that end up affecting air quality may also have an effect on the prevalence of these illnesses. Children in temperature and precipitation, for instance, are expected to increase the number of forest and blush fires which can affect air quality for thousands of miles, and which are generally accompanied by increased number of people experiencing respiratory difficulties of various kinds (Confalonieri, et. al, 2007). Besides this, changing pollen counts, fungal growth and moulds related to flooding, increase in ozone and other pollutants can also play a part in increasing the rate of respiratory problems such as pneumonia, upper respiratory diseases and asthma. Asthma is noted to have doubled worldwide over the last 15 years for instance with greater increase for children (Bunyavanich, et.al, 2003).

❖ **Armed Conflict and Displacement**

Current trends indicate that excessive risk of climate change acts as a precursor to violent acts especially in less resilient and volatile regions; to which the primary victims being children once again as they are both its targets and it's instruments. In wake of this, their suffering bears many faces, born in the midst of an armed conflict and its aftermath; children may be killed or maimed, orphaned, abducted, deprived of educational and health care and left with deep emotional scars and trauma (Report for the Special Representative of the Secretary General for children and Armed Conflict, 2010). In Johannesburg a study undertaken in six neighborhoods in low-income area found sharply elevated rates of injury in the informal settlements as compared to those with the formal council housing (Butchart, et. al, 2000).

Furthermore, displacement, migration and emergency situations almost always have negative impact on children. They increase the possibility of child abuse and trafficking. In the after-math of disasters, children may be pulled out of school and put to work to help families recover. Their education and health suffer accordingly. Other than this, long term negative effects of extended periods of labor cannot be ignored, the loss of which may be irreversible for children (Huebler, 2006). In one such study (Post, 26th December, 2004 Tsunami) of 16,818 children in 38 villages in Kerala 6–9 months after the tsunami found that 1093 of them still complained of chronic fear; 839 said they still feared water; 556 reported constant headaches and frequent stomach pain; 460 had sleep disorders; 276 were still described as in a state of shock; 43 had developed asthma; 16 had lost their speech and were unable to function without help; 20 had lost their hearing, and 16 had lost their eyesight. Some children were still not able to go to school and of those who did, 1164 were reported to have short attention spans and loss of concentration; another 117 were described as socially withdrawn. Overall, 33 children were said to be suffering from severe psychological problems; 1081 moderate psychosocial problems; and 13,274 were described as having mild psychosocial problems (ICMH, 2006; India Info,2005).

Role & Contribution of Psychology/ Psychologists in Bringing about Environmentally Significant Behavior

Psychology/psychologists can aid in contributing its bit towards resorting to improved approaches to changing environmentally significant behavior amidst the ever transforming global climatic pattern and its constant impact on the health and wellbeing of people and the especially vulnerable group among them being; the children. (Discussed in a Report by the American Psychological Association's Task Force on the Interface between Psychology and Global Climate Change, 2011).

- Psychology can help illuminate how people form understandings of the risks of climate change and how those understandings affect individual's concerns and responses.
- Psychologists can help clarify and identify inter-relations (beliefs, skills, needs) and contextual (structural, social, cultural) predictors of population growth and of economic and environmental consumption.
- Psychologists can describe behaviorally-based links between population growth, consumption and climate change.
- Psychologists can identify psycho-social impacts of climate change including:

  - Emotional, cognitive and behavioral responses to anticipated and experienced impacts.
  - Mental health outcomes
  - Social and community impacts.

- Psychologists can explain how stress and coping responses moderate and mediate the psycho-social impacts of climate change and the ability of individuals and groups to respond adaptively.
- Psychologists can improve understanding of the behaviors that drive climate change by providing empirically supported models of behaviors, providing deeper understanding of individual and household behaviors, and applying evaluation research methods to develop and

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improve intervention strategies and design effective and culturally relevant behavior change programs.
- Since psychology has a unique contribution of understanding behavior at the individual level as it already has broadened understanding of the interactive roles of various personal and contextual factors in shaping environmentally significant behavior. This assists in developing an in-depth understanding of the public and organizational behavior that contributes to effective societal responses to climate change.
- Furthermore, psychologists in collaboration with engineers can assist in the design of effective technologies and information systems for responding to climate change by applying their knowledge of cognition, communication and human factors engineering.
- Lastly, psychologists can adopt the following principles to maximize the value and the use of psychological concepts and research for understanding and informing effective responses to climate change thereby maximizing their contribution to the science of climate change:
- Use shared language and concepts of the climate research community where possible and explain differences in use of language between psychology and this community.
- Make connections to research and concepts from other social, engineering and natural science.
- Present psychological insights in terms of missing pieces of climate change analysis.
- Present the contributions of psychology in relation important challenges to climate change and climate response.
- Be explicit about whether psychological principles and best practices have been established in climate relevant contexts.
- Be mindful of social disparities, ethical and justice issues that interfere with climate change.

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