

## Review Article

# Impact of Environment Pollution on Public Health in India

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## ABSTRACT

Climate affects water, food, air quality, diseases, physical comforts and human health. Any change in climatic conditions is likely to affect human health. Relationship between climate and health is an old one as evidenced by increase in the visit of patients to clinics after severe heat, rain and cold. Climate change and associated increases in climate variability will likely further exacerbate global health disparities. This requires more attention, particularly in developing countries like India, to accurately predict the anticipated impacts and inform effective interventions. Many of the predicted effects of climate change are likely to become a reality in India. India is very diverse, geographically, climatically and culturally. India with its huge and increasing population and rate of urbanization in undergoing enormous change; climate change poses an overwhelming stressor that will magnify existing health threats. The joint Indo-U.S. workshop conducted in the year 2009, on climate change and public health in Goa, the potential health impacts are divided into three categories: 1) Heat stress and Air pollution 2) Water borne diseases and 3) Vector borne diseases focusing on malaria. The importance of climate change leading to estimated loss of 2.5 million DALY's (Disability adjusted life years) in south east Asia, mortality due to heat waves and the importance of air quality related respiratory diseases, disasters due to excessive floods, malnutrition due to reduction in food crops etc., Climate change has set in and will alter spatial and temporal distribution of vector borne diseases, exacerbation in heat related mortality, air pollution related respiratory diseases and water borne diseases, if current scenario continues. In tropical countries like India, most of the identified adverse health effects due to climate change are already experienced. A greater understanding of the relationship between climate variability and human health in a country such as India could aid in the development of new prevention strategies and early warning systems, with implications throughout the developing world. Futures studies were work to more explicitly define the relationship between climate variability and emerging and reemerging infectious diseases like dengue, yellow fever and chikungunya virus, as well as chronic diseases related to cardio vascular and respiratory illness, asthma and diabetes. Millions of people below the poverty line and those in rural areas suffers with poor sanitation, pollution, malnutrition and a constant shortage of clean drinking water. However, as awareness and public health infrastructure increase, the burden of climate related diseases may be negated.

## Keywords

Impact of environment pollution, public health, India

## Introduction

### Climate Change and Human Health

Climate affects water, food, air quality, diseases, environment, physical comforts and human health. Changes in climatic

conditions are usually termed as climate variability. The variability of temperature over a period of hundred years in the last century in India has been reported as  $0.5^{\circ}\text{C}^{-1}$ . Since 1990 there has been sharp increase in

global temperatures<sup>2</sup> which explains the greater awareness about the potential impact of climate change on different sectors including human health.

The direct impact of weather on human health is mortality due to increased temperature, disasters resulting the flood, loss of life and infrastructure due to cyclones etc., impact on water-borne diseases and vector-borne diseases, malnutrition and respiratory diseases<sup>3</sup>.

Although low and middle income countries are responsible for only small percentage of global green house gas emissions, the adverse health effects associated with climate change will likely form disproportionate on their populations. This inequity will further exacerbate global health disparities<sup>4</sup>. Changing temperatures and precipitation patterns linked to climate change will further affect health by changing the ecology of various vector-borne diseases, such as malaria, dengue, chikungunya, Japanese encephalitis and filariasis<sup>5</sup>.

### **Impacts in India**

Climate change and associated increases in climate variability will likely further exacerbate global health disparities. This requires more attention, particularly in developing countries like India, to accurately credit the anticipated impacts and inform effective inventions. Many of the predicted effects of climate change are likely to become a reality in India. A greater understanding of the relationship between climate variability and human health in a country such as India could aid in the development of new prevention strategies and early warning systems, with the implications throughout the developing world. Future studies must work to more

explicitly defined the relationship between climate variability and emerging and reemerging infectious diseases such as dengue, yellow fever, cholera, and chikungunya virus<sup>6</sup>, as well as chronic diseases related to cardio vascular and respiratory illness, asthma and diabetes. Millions of people below the poverty line and those in rural areas represent high-risk pollutions who are exposed to myriad health risks, including poor sanitation, pollution, malnutrition and a constant shortage of clean drinking water<sup>7</sup>.

### **Impact of Heat**

The summer of 2010 was the hottest summer on record in India, with temperatures approaching 50<sup>0</sup>C (122<sup>0</sup>F). Heat exposure has a range of health effects, from mild heat rashes to deadly heat stroke. Heat exposures can also aggravate several chronic diseases, including cardio vascular and respiratory diseases. The results can severe and result in both increased illness and death. In a study of 12 International urban areas that included Delhi, found a 3.94% (95% Confidence Interval (CI), 2.80-5.08%) increase in mortality for each 1<sup>0</sup>C increase above 29<sup>0</sup>C. Hajat *et al.*, (2005)<sup>8</sup> reported that individuals in the 0 to 14 year –old age group had greater vulnerability to temperature increases in Delhi then did those in 15 to >65years old age group.

These findings are indirect contrasts with results from cities in Europe and USA that consistently identify the elderly as the more vulnerable age group. This indicates that the local adoptive capacities of people plays a key role. Thus, there is a large scope of studying the vulnerable region, month, cutoffs of temperature, age group and malnutrition status of victims of heat wave so as to advice the people for better protection.

### **Air quality- respiratory diseases**

The quality of air is likely to decrease as surface ozone concentrations begin to rise with increasing temperatures. This will lead to an increasing incidents of asthma and cardio vascular and respiratory diseases<sup>9</sup>. This issue is being addressed by the Government of India by introducing the compressed natural gas (CNG) for transport and replacement of wood fire for cooking by the liquid petroleum gas (LPG) in villages<sup>10</sup>.

### **Disasters**

Excessive floods, cyclones, storms and earthquakes usually caused loss of life, infrastructure and human resources. As per projections of extreme events due to climate change, loss of life and mental stress are expected in vulnerable people. Lessons learnt from the past would serve as guiding principles for formulating preventive measures and combating tools. National Institute of Disaster Management, set up by the Government of India is making headway in imparting training to different sectors and mapping the disaster prone areas in India which should serve as a baseline for development of preparedness plans to meet adverse impacts.

### **Water-borne infectious disease**

The burden of water-borne disease in India is enormous. Excessive floods contaminate drinking water creating conditions for transmission of diarrheal diseases like cholera. A report from the Ministry of Health and Family Welfare estimates that nearly 40 million people are affected by water-borne disease every year that places a large burden on both the health sector and economic sector. Although the WHO estimates that 9,00,000 Indians die each year from drinking contaminated water and

breathing polluted air, the Indian Ministry of Health estimates 1.5million deaths annually, in 0 to 5 year-old children. Cholera provides another example, with approximately 5 million cases reported by WHO each year; this estimate is thought to be a gross underestimation of true burden of Cholera because of a lack of reporting, lack of surveillance and minimal data infrastructure<sup>11</sup>. This may be due to the fact that approximately 73% of the rural population in India does not have proper water disinfections and 74% do not have sanitary toilets<sup>12</sup>. Therefore, there is a need to establish a reliable surveillance systems and generate evidence, showing the link between diarrheal diseases and climate change.

### **Water scarcity and malnutrition**

Scarcity of availability of water for crops and high temperatures will affect agriculture resulting the less production. As per World Bank, India ranks at number 2 after Bangladesh where about 47% of children exhibit a degree of malnutrition<sup>13</sup>. The reduction in agriculture produce is bound to have a negative impact on human health leading to malnutrition, if not addressed in time.

### **Vector-borne diseases**

Spatial and temporal distribution of vector-borne diseases like malaria, dengue, chikungunya and Japanese encephalitis are likely to be affected the most as the mosquitoes which transmit the diseases are cold blooded. India has approximately 2 million conformed cases of malaria per year<sup>14</sup>. In a recent study by Dhingra *et al.*, (2010)<sup>15</sup> estimates approximately 2,00,000 malaria deaths per year in India before 17 years of age and 55,000 in early childhood. As he suggest, accurate estimation of

malaria mortality in India is difficult because correctly diagnosed episodes of successfully treated and do not result death; in fatal cases without medical intervention, malaria is easily mistaken for some other life threatening fever; and in most rural areas where death from malaria is common, proper medical attention at the time of death is uncommon. These challenges, which hold true in many developing countries, make it difficult to use hospital-based data to access the association between climate variability and malaria, because disease burden may be vastly under estimated.

### **The need for adaptation**

Adapting to climate change will be necessary and will occur at physiological, behavioral, social, institutional and organizational scales. To take advantage of already ongoing adaptations for creating more effective public health responses to climate change impacts-especially for poor rural communities whose access to health care is extremely limited even in the current policy environment – developing a base line understanding of the region – specific demography, social and ecological determinants of health will be necessary.

In designing public health responses, factors that must be consider include the population's age structure, socio economic profile, baseline prevalence of climate – sensitive diseases, public awareness of risk, the built environment, existing infrastructure and available public health services. Furthermore adaptation strategies in response to climate variability and change must be designed on specific temporal and spatial scales relevant to India.

Potential adaptation strategies in India could focus on controlling infectious diseases by removing vector breeding sides, reducing

vector-human contact via improved housing, and coordinating monitoring of mosquitoes pathogens, and disease burden. Another potential focus area for adaptation could be improving sanitation and drinking water by supporting inexpensive and effective water treatment and increasing rain water harvesting, safe storage, and gray water reuse. One possible outcome could be the development of an integrated early warning system, emergency response plans, and refugee management plans, along with increased capacity to provide shelter, drinking water, sanitation and sustainable agricultural products to the most vulnerable populations.

### **Remedial Actions**

#### **Environmental monitoring and surveillance**

There is a great need to improve environmental monitoring and surveillance systems in low and middle income countries such as India. New research initiatives should focus on collecting high quality, long term data on climate related health outcomes with the dual purpose of understanding current climate – health associations and predicting future scenarios. Such data gathering should occur in conjunction with already existing public health programmes and health centers. Where the necessary public health infrastructure does not exist, the anticipated risks associated with climate change should motivate international action to build such infrastructure.

#### **Geo spatial technology**

Geographical information systems and spatial analysis must be further developed: they are very useful tools when conducting vulnerability assessments, assessing environmental exposes, prioritizing

research, and disseminating findings to decision makers and the public alike. Remote sensing and environmental monitoring are particularly useful to catalog variables such as air pollution and heat exposure. Data on land use and land cover can provide additional information on relevant environmental factors that influence risk and vulnerability.

### **Human and technical capacity**

For these new surveillance methods and analytical techniques to be effective, countries like India will need to enhance their human and technical capacity for risk communication. This could take the form of public education on climate change and associated health impacts to enhance awareness and to influence life style, behavior and individual choices to protect improve health.

Climate change has set in and will alter spatial and temporal distribution of vector-borne diseases; exacerbation in heat related mortality, air pollution related respiratory diseases and water-borne diseases, if current scenario continues. In tropical countries like India, most of the identify adverse health effects due to climate change are already experienced.

The need of the hour is to undertake situation analysis for reasons of persistent disease burden and identifying the operational gaps. Local practices being practiced by the communities to face challenges like floods, heat strokes and protection from mosquito bites should be documented and encouraged as adaptation measures. Economics would play a major role in combating the potential threat. Countries with good GDP (Gross Domestic product) would be able to introduce the best available tools of intervention and can fill up the lacunae in health system.

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