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Scenario Of Climate Change And Human Health In India

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Abstract:

The article review the issues related to climate change and its adverse impact on human health in India. Evidences shows that in India climate change has caused threat to public health from extreme weather related disasters like air and water borne infection, vector borne infectious diseases and heat related morbidity and mortality. Research linking temperature and health effects in India is sparse. Understanding of the current impact of weather and climate variability on population health is the first step for assessing the effects of temperature, rainfall, infectious diseases and extreme weather.

Key words: climate change, climate variability, health, vector-borne, water-borne

1.Introduction

Developing countries like India are responsible only for a small percentage of greenhouse gases and global warming but this accounts for significant impact on health. Increase in global temperature affects water, food, air quality, infectious diseases, physical comforts and human health. Researches have estimated that climate change have caused 150,000 deaths and 5 million illnesses each year[1]. Vulnerable population includes elderly, children, pregnant ladies, urban populations and slum[2]. The relationship between climate and health is evidenced by the increase in the visit of patients to clinics after severe heat, rain and cold. Variation in climate temperature over a period of 100 years in India has been reported as 0.5°C[3]. The IPCC [4] has projected rise of about 4°C in temperature, increase or decrease in rainfall patterns and a rise in sea level up to 0.59 metres by the year 2100.

2.Extreme Climate Scenario

Extreme weather events include high temperature, torrential rains and flooding, droughts and storms. The effects of extreme weather events have claimed loss of life, infrastructure or economic losses and human resources. India and the subcontinent have witnessed five of the 20 natural calamities recorded worldwide[5]. Coastal areas of India are vulnerable to cyclones and tsunamis. Heat wave and related health impacts are always considered as a neglected climate calamity in development countries.

2.1.Heat Wave And Drought

Taking account of the occurrence of heat waves for the period 1978 to 1999[6], reported heat wave related deaths of ~1625 in Rajasthan, followed by Bihar, Uttar Pradesh and Odisha. From 1999–2003, a total of 3,442 heat-related deaths have been reported[7,8] reviewed heat wave mortality. In 2002, Andhra Pradesh had a toll of ~1400 lives, when the ambient temperature rose to 54°C. During 2003 May months, heat wave brought peak ambient temperatures between 45°C and 49°C, taking ~1500 death toll [9]. Patil and Deepa[10] viewed the frequent weather events, and heat waves in eastern India as potential evidence of climate change. Akhtar[11] highlighted the impact of climatic variability (rainfall, heat waves, etc.) in relation to mortality. In 2009, Rajasthan and Uttarakhand and at least a dozen other states were hit by heat waves. Severe drought conditions is a major parts of north India, north east India and parts of Andhra Pradesh and Tamil Nadu destroyed crops to the tune of USD 25 million, with many starvation deaths being reported. In 2010, Ahmedabad, hit by deadly heat wave were wave temperatures spiked at 46.8°C killing hundreds of people in the city mostly senior citizens. In this year 2013 more than 600 person in India have been killed by heat wave and most affected states Andhra Pradesh and Odisha.

2.2.Effects Of Retracting Glaciers And Rising Sea Levels

Kovats and Akhtar[12] overviewed recent extreme heat events and discussed health impacts with reference to precipitation, rising sea-levels and retracting glaciers with reference to Asian cities. Health effects due to sea level rise cause death, injury due to flooding,

reduce availability of fresh water, contamination of water supply and health effect. The World Health Organization [13] have projected that an increase in glacier melt runoff by 33-38 and diverse health consequences are like traumatic, infectious, nutritional, economic dislocation and environmental decline. Research on satellite pictures reveal that the glacier was shrinking and claimed that the Siachen Glacier reduced to 5.9 km in its longitudinal extent from the time period of 1989 to 2009 [14]. This happened because of increasing temperatures. It is even worse that the satellite images displayed increasing numbers as well as sizes of blue lakes in glaciers. IPCC [4] predicted that by the year 2030, the Himalayan glaciers will shrink from 500,000 km² to 100,000 km² resulting in outburst of north Indian rivers.

2.3. Effects Due To Food Insecurity

Increasing in temperature and rainfall cause loss of agricultural land and reduce crop yields in different regions of India. Which cause threatens to food security, malnutrition and public health problem. According to World Bank, India ranks at number two, as about 47% of the children exhibited degree of malnutrition [15]. Anaemia is another health problem caused due to malnutrition specially women and children. In India 70% children between the age 6 month to 5 year, 55% women and 25% of men population are anemic [5].

2.4. Effects Of Variable Precipitation Pattern

Extreme weather is also associated with cyclone, flood and severe tsunami. In 2003, floods claimed thousands of lives and rendered millions of people homeless in Assam, Bihar, West Bengal, Odisha, Uttar Pradesh, Himachal Pradesh, Rajasthan, and Gujarat. In 2005 Mumbai have received heaviest rainfall killing nearly 600 people and according to Indian Meteorological department Mumbai received 94.4 cm rainfall in a single day. October 1999 super cyclone in Odisha, with wind speed over 300 km/h, have caused nearly 10,000 deaths [16]. A tsunami affecting Tamil Nadu, Andhra, Kerala, and the Andaman-Nicobar Islands in 2004 causing havoc to property, life and health. Recently, in the month of June 2013 Uttarakhand has witnessed a cloudburst and flood which cause unleashed death and destruction. These natural extremities leads to endangering food security, affect water quantity and quality and also damage health and infrastructure.

3. Role Of Climatic Factors On Human Health

3.1. Air Quality And Related Health Effects

Climate can influence the concentration of air pollutants and promoting the formation of secondary pollutants. Studies show that ozone irritate the respiratory system, reduce lung function, aggravate asthma and damage lung cells which may cause permanent lung damage and aggravate chronic lung diseases [17]. Weather condition and vehicular pollution can influence the transportation of airborne pollution and allergenic pollens leading to respiratory disorders such as asthma, emphysema and chronic bronchitis, and allergy problems [18]. Climate change also cause diseases like chronic obstructive pulmonary disease, pneumothorax, and respiratory infections in children, elderly, ailment person and other [19]. IIPS [20] reported that in India around 6% children suffer from respiratory tract infection and 2% of adults suffer from asthma.

3.2. Water And Infectious Diseases

Water is fundamental for life and scarcity or excess water affect human health which may increase the chance of food and water-borne diseases. Scarcity of water affect agriculture resulting in less production. Heavy rainfall events can transport terrestrial microbiological agents into drinking-water sources resulting in outbreaks of cryptosporidiosis, giardiasis, amoebiasis, typhoid, cholera and other infections. In India the burden of water borne diseases is enormous but are unreported due poor surveillance, awareness and minimal data infrastructure. The World Health Organization (WHO) estimates that 900,000 Indians die each year from drinking contaminated water and breathing polluted air [21] and Indian Ministry of Health estimated 1.5 million deaths annually between 0 to 5 year old children. A reduction in the availability of clean water increases the risk of contamination and thus leading to infectious diseases. NCMH [22] reported that in India disability adjusted life years (DALY) lost due to diarrhoeal diseases were 23.8 lakhs in 2006 and by 2016, 21.4 lakhs DALYs are projected. Every year in India around 0.6–0.7 million children under five year die from diarrhoea.

3.3. Vector-Borne Infectious Diseases

Change in weather pattern and precipitation further affect the transmission of many infectious vector diseases, e.g. malaria, plague, dengue fever, chikungunya, Japanese encephalitis, kala-azar, filariasis and diarrheal diseases [23,24]. Enzley and Barros [25] conducted a household survey in India and found that the morbidity rate of children under five year due to diarrhea is about 1.7. In the year 1994 Surat plague had resulted 59 deaths. Heavy rainfall result in breeding ground for mosquitos. Every year ~2 million cases of malaria cases confirmed in different regions of India i.e., Odisha, Jharkhand, Madhya Pradesh, Chattisgarh, West Bengal, and North East [26]. The World Health Organization [27] in 2008 estimated that in India each year approximately 15,000 die due to malaria. Recently Dhingra et al. [28] estimated that malaria mortality in India is difficult and found that approximately 200,000 deaths per year before 70 years of age and 55,000 in early childhood. Dengue is another important disease occurring in tropical and subtropical regions.

3.4. Impact Of Heat Stress

Heat stress and strain are multifactorial and combination of heat stress, dehydration and physical activity impose challenge for physical adjustment, with potential risk of ensuing heat related injuries and disorders, e.g., heat cramp, heat exhaustion, heat syncope[29]. Prolong exposure to solar radiation may cause a substantial amount of body water lost as sweat, including loss of fluid through respiration, gastrointestinal tract as well as kidney which disturbs the homeostasis of the body [30,31], leading to decreased skin blood flow, elevated core body temperature (T_{cr}), decreased sweat rate, tolerance to work, and increased risks of heat injuries[32-34]. The National Laboratory, New Delhi predicted heat stress on human health in view of climate change using PRECIS model A1B scenario and showed maximum temperature for three consecutive days in the range of 45–50°C in April to June months in the years of 2030, 2050, and 2080 in some districts of Andhra Pradesh, Bihar, Gujarat, Odisha, Rajasthan, Uttar Pradesh, and West Bengal [3]. Increased temperatures are also likely to cause increase in eye diseases (cataract, dry eyes, pterygium) and skin diseases.

3.5. Other Factors

Increase in global temperature also affects the level of seasonal pattern. Stratospheric ozone depletion and greenhouse warming is also an essential factor of climate change causes skin cancer and induce immune suppression.

4. Conclusion

Monitoring Climate change and health impact is an important task which requires public health strategies and improved surveillance. In tropical countries like India, limited information is available both prospective and retrospective data at a local or national level to assess climate variability and disease outcome. WHO recent report has estimated that the global disease burden due to climate change caused spatial and temporal distribution to vector-borne diseases, heat related mortality, air pollution and water borne diseases. The process of climate change is gradual and detectable. There are many government and non-government organization monitor the health effects in recent years. The impact of climate change over health and the risk factors are difficult to detect early health effect on climate change. Research methods are required to established temperature-disease relationship between population in different geographical areas. Remote sensing and environmental monitoring is particularly useful to catalogue variables such as air pollution and heat exposure.

But to establish a particular trend long term monitoring and analysis are required to conclude for the causal relationship between climate and health. Risk factors in terms of water availability, storage practices and life style also need to be determined. As precautionary measures, early warning system for preventing outbreaks is need of the hour. In India the main health concerns under climate change are malaria and cholera, thermal stress and air-pollution related illnesses. Water-borne diseases such as cholera, and diarrhea diseases commonly occur due to contamination of drinking water in many regions of India.

At present research gap include need for more systematic surveillance of climate change and health states of India. Also there is a need of longitudinal study to facilitate both health data and its linkage with indoor and outdoor climate and determinates of vulnerability. More research is needed to accurately predict the impact of climate change and inform effective interventions.

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