"Whoever wishes to investigate medicine properly, should proceed thus: in the first place to consider the seasons of the year, and what effects each of them produces, for they are not all alike, but differ much from themselves in regard to their changes."

... Hippocrates

“We don’t have to protect the environment; the Second Coming is at hand.”

... James Watt

This quote by the Father of industrial revolution was supposed to be cynical. Today, if we take stock of the degradation and depreciation of the environment, the same words sound prophetic. Alas! It is very difficult to obtain a true and fair picture of the situation. Expert opinions are as wide apart as are the two poles of the Earth. In terms of the swing of a pendulum from apologetic optimism to brave pessimism the environment stands next only to politics. If one considers clichés, proverbs and aphorisms the environment will find a place second only to religion and morality. Since there are uncertainties, variations and perception differences amongst experts, it is inevitable that these issues are discussed in the public domain.

The impact of climate change was brought into sharp focus last year when the Nobel Peace Prize was awarded to the Intergovernmental Panel on Climate Change (IPCC), along with Albert (Al) Gore, for “their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change.” The IPCC, in its latest assessment report of 2007, has confirmed the role of human activity in climate change and has elaborated numerous consequences relating to human health.

The recently-published ISOTHURM project showed an increased mortality in various cities across the globe, owing to both high and low temperatures resulting from climate change. Several studies have shown that climatic factors affect the incidence of diseases such as cholera, malaria, dengue, bacillary dysentery, yellow fever, Rift Valley fever, asthma and so on. There is considerable consensus that the health-related consequences of climate change will primarily impact three main aspects of health and disease: heat waves, vector-borne illnesses and malnutrition.

Additionally, though the contribution towards climate change made by developing nations is relatively small, they will bear the greatest adversities arising from these global phenomena. This is not a geographical consequence, but one of limited socioeconomic capabilities to withstand the increased burden of climate adaptation, disaster management and disease control.

It is safe to propose a caveat that there has been uncontrolled acceleration in utilization of natural resources since the industrial revolution. Transportation is, by far, the greatest end-use consumer of energy and affects health directly by way of a myriad respiratory illnesses. Land use, forestry, and agriculture also contribute to climate change and affect health by increasing atmospheric levels of carbon dioxide, shaping the infrastructures for both transportation and buildings.

The net result is depletion of natural resources beyond redemption and disruption of ecosystems at the peril of flora and fauna. There is a looming danger of a change for the worse, unless prompt measures are taken for restoration, conservation and resurrection. A multifaceted problem of such mammoth proportions calls for global cooperation. It must be stated, in the same breath, that there have been sufficient efforts to define the problem from various angles. Massive databases, exchange of information, arousal of public opinion, formal education, efforts by international agencies and civic societies are putting in the best of the efforts.

The current scenario has aptly been summarized by AJ McMichael: “The world population is encountering unfamiliar human-induced changes in the lower and middle atmospheres and worldwide depletion of various other natural systems... Global climate change is likely to change the frequency of extreme weather events: tropical cyclones may increase as sea surface waters warm; floods may increase as the hydrological cycle intensifies; and heat waves may increase in mid-continental locations. A change in the frequency and intensity of heat waves and cold spells would affect seasonal patterns of morbidity and mortality” and “Climate change also is expected to affect health via various indirect pathways, including the
patterns of infectious diseases; the yield of food-producing systems on land and at sea; the availability of freshwater; and, by contributing to biodiversity loss, may destabilize and weaken the ecosystem services upon which human society depends." These are not Nostradamus' predictions for the future. These scientific predictions of 2003 are being experienced all over the world today. We must leave the Macro-environment issues to the domain experts and focus on ever-changing climate as a consequence and its impact on human health.

While a physician is marinated in the theory of milieu intérieur described by Claude Bernard (1860) that states “The constancy of the internal environment is the condition for a free and independent life,” we overlook his opening sentence: “I think I was the first to urge the belief that animals have really two environments: a milieu extérieur in which the organism is situated, and a milieu intérieur in which the tissue elements live.” The time has come to recognize milieu extérieur simply because humankind has disrupted natural checks and balances. The pathogenesis of environmental disruption and its impact on health and disease is depicted in Fig. 1.

The complex relationships between the elements of environment and therefore their outcomes are not easily predictable; or else these could have been reduced to a mathematical equation. While we know that a heat wave will yield few dozens of heat strokes, we cannot say with any degree of certainty as to who will suffer and who will recover. On the other hand prevention at individual level and community level is not very difficult.

El Niño-Southern Oscillation (ENSO) is an ocean-atmosphere phenomenon that causes climatic effects in various parts of the globe. It is associated with floods, droughts, and other disturbances in a range of locations around the world (Fig. 2). The impact of ENSO on rainfall in tropical areas is well established. In a monsoon-dependent country like India, the chief determinant of malnutrition will be how ENSO turns out to be for a given year. These effects, and the irregularity of the ENSO, makes predicting it of high interest. In recent years, ENSO phenomena have been predicted with reasonable accuracy. While we cannot change these phenomena, we can certainly be prepared for their impact on malnutrition. An appropriate health policy for such an eventuality is the right prescription.

The lack of rainfall in South India for consecutive years around 1957 led to migration of primates from the forest to domestic areas in search of food. A zoonotic disease, later named Kyasanur Forest Disease (KFD), progressed as an epidemic in the human population. It was a crisis situation then. After the natural history of KFD was revealed by the Virus Research Centre, Pune, a flavivirus was detected, which was transmitted by the nymph of a tick (Haemaphysalis spinigera).11

Today, should the circumstances recur, we know that the prescription for the situation will be control of ticks and may be the vaccine. No, we cannot control the climate; but we can surely mitigate its adverse effects!

Extreme climatic events usually hit as disasters. India has, in recent times, been witness to a few massive monsoon phenomena, namely the Orissa cyclone of 1999 and the post-monsoon deluge in Mumbai in 2006. Unless the medical profession is prepared to deal with such eventualities and to work in tandem with the public health systems, the fatalities are sure to be high. Infectious diseases
are an inevitable fallout of climate change. This need not be restricted to rare entities like KFD. A few common conditions likely to increase in incidence are malaria, dengue fever, leishmaniasis, leptospirosis, typhoid, hepatitis, and the menacing avian influenza. The differential diagnosis of pyrexia of unknown origin is a nightmare for a physician, particularly in a metropolis. The burden of disease is already high in India. Even a little change in climate can create panic; the way it happened in Mumbai in 2004 and 2006 with leptospirosis following heavy rains.

Now that climate changes are inevitable and unpredictable, our responses must move from science to policy. The medical community cannot be a silent spectator or helpless observer.

**Knowledge-Application Gap**

The major challenge after acquisition of knowledge is its effective application. Edward Jenner had established efficacy of a vaccine to prevent smallpox. The disease could have been eradicated globally in 15-20 years. Yet, it took 181 long years to achieve this feat.

Carlos Finlay, a Cuban doctor and scientist, first proposed proofs in 1881 that yellow fever is transmitted by mosquitoes rather than direct human contact. Lamentably, almost 20 years had passed before Walter Reed, an American Army surgeon confirmed Finlay’s theory. Col. WC Gorgas of the US Army controlled malaria and eliminated yellow fever in the Panama Canal Area by environmental control, between 1904-09. Almost a century later, the disease is far from controlled, despite advancements in biology and management techniques.

The Mumbai police have arrested more than 11000 persons for driving under influence of alcohol. The campaign has brought in fall in fatalities consequent to drunk driving, as one would expect with common sense. One may question as to why the campaign was not undertaken two decades back; and even more important, why is it not being intensified all over India? The prescription is glaringly obvious.

Mumbai’s suburban railway network claims almost 10-15 lives every day. Most of the deaths are caused due to unauthorized crossing on rail tracks. Is the cost of fitting a kilometer long iron grill at every suburban station so high that it cannot pay out for the untimely loss of young commuters? The prescription is glaringly obvious here too.

The Centers for Disease Control and Prevention’s Morbidity and Mortality Weekly Report found there were 399 hospital admissions for heart attacks in Pueblo in the 18 months before the city’s smoke-free ordinance took effect on July 1, 2003, compared to 237 heart attack hospitalizations in the similar period from 18 months to three years after this date – a decline of 41%. This good news raises a question. Did science not prove this association between smoking and IHD since at least 1976? Forty years ago, the US Surgeon General sent shock waves through the nation when he released a report linking smoking to lung cancer and other serious diseases. All these decades later, it is still a tough ongoing battle. It will be interesting to see the public health impact in India on ban of smoking in public places. The British Medical Association (BMA) has been calling over decades and still calls for a total ban on boxing, amateur and professional.

Perhaps there is inertia. Perhaps there is a resistance to change. Perhaps there is no pressure group to motivate the policy makers. New ideas should always be scientifically tested. But there is no reason to abandon them, especially if they hold merit. It is a matter of conviction over convenience. The above examples show the importance of forming an opinion, get it translated into policy and sustain the battle with optimism. Will they succeed? Yes. I think, with efforts and pragmatism, they can! These examples also demonstrate the role played by Physicians to act as influential citizen to mould Public Policy.

International cooperation has been visible when mankind eradicated smallpox; or, more recently, when global efforts converged to counter SARS. Science and technology have enabled us; but have they empowered us? To borrow the phrase of the forty-fourth President of the USA, one can say “Yes, we can!” But the more pertinent question is “Will we?” The answer seeks something more than knowledge; it seeks motivation. And being the most knowledgeable and influential, the buck stops at the door of us physicians!

**References**


