

Climate change, pollution, occurrence of diseases and changes in life style for healthy living

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Abstract

Unprecedented expanding human populations are transforming environments at unprecedented rates. Scientists have long sought to quantify how humans impact various aspects of animal biology, such as population levels, reproductive and mortality rates, movement and activity patterns, foraging behaviour, and stress responses. Changes in climate affects ecosystem and causes extinction or threat to survival of biodiversity. For our healthy survival it is key to preserve the global biodiversity, and maintain the integrity of ecosystems, and there is need to study the predicting global zoonoses and environmental changes. This knowledge is not only worth billions of dollars, but is also vital for shaping a sustainable future. So far, researchers have had to rely predominantly on purely observational approaches. The review paper brings out effect of climate change, increase in disease occurrence and changes in lifestyle needed for our healthy and happy life.

The present plight of the world as a victim to a surfeit of environmental setbacks ranging from global warming and ozone layer depletion to an alarming increase in world pollution levels is threatening the existence of the most intelligent species on earth. This has been enough for both environmentalists and laymen to wake up to the indisputable importance of environmental protection and eco friendly alternatives. Environmental biotechnology is mainly the first alternative, with fields of application reaching out to every quarter. The microorganisms and plants will be used for the preservation and restoration of the environment. Indoor air pollution has reduced now but efforts are needed to change our food habits and bring changes in lifestyle for longevity and healthy life.

Keywords: Climate change, Diseases, Changes in life style, Healthy life, Yoga, Medicinal plants

1.1 Introduction

The human vulnerabilities to air pollutants result in an alarming figure of seven million people that die prematurely each year. The harmful effects caused to human body with the polluted air depend upon the type and concentration of pollutants present. Man cannot survive without fresh air, it becomes our bitter enemy as and when it gets polluted, since it causes a number of diseases in our body. The air pollutants primarily may cause respiratory and skin diseases. High concentrations of toxic gases like carbon monoxide in indoor pollution and methyl isocyanate released accidentally during Bhopal Gas tragedy resulted in huge casualties in 1984. Gaseous air pollutants do not exist singly in the atmosphere. Therefore, researches on interactive effects of air pollutants must be encouraged to understand the role of air pollutants on human health. Not only gaseous pollutants but also biodeteriogens like Fungi, Bacteria and aeroallergens like pollen grains of plants can cause harm to human life, and reduce their longevity.

The little joy and happiness surrounding us that we earlier used to miss are now the best things of the day making us smile and feel nice. People are consuming healthy diet and decoction of leaves of *Ocimum* and dried stem of *Tinospora* as immunity enhancer. People are doing regular exercise and yoga to keep them fit. Be it peacefully listening to birds chirping, enjoying the sunrise and sunset and sometimes the pit pat patter of rain drops falling on the window panes. The small moments of our lives or well the un-noticed things in the busy and hectic schedule of our lives have returned back. In this quarantine period many of us have discovered the joys of small things and have found happiness in anything we do or in anything that gives us positive vibes. For some positivity is in enjoying the morning and evening tea with a splendid sunrise and sunset, while for some it maybe gardening, painting, dancing, listening to music, cooking, baking etc.

and for some it can be as simple as reading a nice book without any disturbance. Positivity keeps the body, mind and soul healthy. The calm and peaceful mind is must for a healthier oneself.

1.2 Climate change and ancient civilizations

Indus valley civilization developed in Harappa and Mohenjo-Daro five thousand years ago. It is said that civilization flourished on the banks of river Indus or Sindhu. A flood might have washed the two towns. Lothal was situated on coastal banks of Gujarat. Its remains are still present on way to Bhavnagar. Egyptian civilization is well known on the banks of river Nile, we had Iran that gave man the mortal attractive story of thousand nights and some share in mathematics and poetry. Now our curve goes through north India not through its south, according to Gustavo Lo Bon in his book about the civilization in India there were no literary effects in north India, and the stony buildings found there do not exceed the fifth century A.D. In China where our curve goes through its south part in ancient times, according to Ralf Linton, the north part of China knew civilization after the south one by about 1500 years, where the age of civilization in China extends to the third thousand B.C. The tilt of earth results in global cooling and heating. The last glaciation period occurred some 10,000 years back. The climate change has seen periodic change in Gymnospermous flora to more adapted vascular plants called Angiosperms or flowering plants. The global changes has resulted in extinction of Dinosaurs and woolly mammoths from the earth. The population of lions and tigers is reducing and a large number of amphibians and birds are on endangered category.

The cities of past were different from present ones some 100 years ago. Massive industrialization has caused anthropogenic effects of climate change and global warming. Technologies have made cities more liveable and changes made in the lifestyle, can reduce the need of resources. As well as safe methodologies suggested to recycle the municipal waste will result in pollution free atmosphere. New cities have to be better planned and should be well managed to meet the demands of citizens and add to the safety, security, and economy of nations. Pollutants both gaseous and microbial should be monitored regularly. People should consume clean drinking water and unadulterated foods.

1.3 Pollution in indoor air

Thermal environment was evaluated based on continuous measurements of indoor air temperature in Poland (Kaczmarczyk et al. 2017). The air quality evaluation focused on the analysis of CO₂ concentration in relation to the concentration outdoors. Carbon dioxide produced by human breathing is a good indicator of air quality in spaces where the main pollution sources are occupants. The monitoring of these parameters, namely air temperature and the CO₂ concentration of the air was conducted for at least 3 week periods during the heating season. Data were recorded in 5-min intervals. Additionally, spot measurements of mean radiant temperature and air velocity were carried out in selected locations. Moreover, outdoor air temperature was recorded by a local weather station. Continuous monitoring of indoor parameters was conducted with small loggers (AR235, APAR, Poland). The accuracy of temperature sensor was ± 0.5 °C. The uncertainty (at a 95% confidence level) of CO₂ monitors was 3% of the reading + 10 ppm (Sensotron, Poland). For spot measurements, a ThermCondSys 5500 measuring system equipped with omnidirectional thermal anemometers, and air temperature sensor, and a black globe temperature sensor to determine mean radiant temperature were used (Sensor Electronics, Poland). All measurement instruments fulfilled requirements for accuracy according to EN ISO 7726 (EN ISO 7726- 2001). Prior to the investigation, all sensors were calibrated and rechecked after the completion of measurements. The temperature and relative humidity loggers were placed in several locations within predefined thermal zones of the investigated buildings. At least one logger monitored each zone. In larger spaces, i.e. in kitchens open to a dining or living room, two loggers were used. The loggers were not exposed to direct sun and were placed away from the heat sources at a location allowing the air to freely move around the sensors. The CO₂ monitors were placed in rooms where occupants spend most of their time when at home.

The overall evaluation of thermal environment as averaged over the floor area indicated the best conditions in the apartment (in building C) and the worst conditions in building A. The answers to the questionnaires showed that thermal environment was rated as acceptable in all but building A. In these buildings, one occupant answered to feel cool occasionally. Nevertheless, none of the occupants of the investigated buildings used any additional heating or cooling device. In all the buildings, the occupants were

satisfied with air quality indoors. The paper demonstrates the on-site diagnostics of indoor air and thermal environment quality in three dwellings. The presented measurements and evaluation results are shown only for the heating season, as both heating and ventilation systems were in operation. From the point of view of the analysis of energy use in buildings without cooling, it is suggested that diagnostics of indoor environment should be performed especially during the heating season. The method applied in the presented study is based on the recommendation given in standard (EN 15251-2007). The occupants' behaviour, i.e., individual settings and occupancy time, should be carefully considered to interpret the results correctly. The thermal environment and indoor air quality were classified by categories from the highest, Category I, to the lowest, Category IV, as defined in (Ioannou and Itard, 2015). Category III relates to a moderate, acceptable level of expectations and is assumed sufficient for existing building, while new or renovated buildings should assure the requirements for Category II. According to the standard (EN 15251-2007), an adaptive model was assumed to define criteria for the evaluation of thermal environment categories, since none of the investigated buildings were equipped with mechanical cooling. The adaptive model, unlike the Predicted Mean Vote (PMV) model, which is recommended for use in buildings with mechanical cooling, assumes that the occupants take actions to adjust to the actual thermal environment, e.g., open windows or adjust their clothing. The indoor operative temperature range is determined in the adaptive model based only on outdoor temperature, regardless the activity or clothing of occupants. Ioannou and Itard (2015) showed that, for the prediction of PMV index in dwellings, the most important parameters are the metabolic rate and the clothing thermal insulation. The air quality was generally satisfactory in all studied buildings. However, the increase in CO₂ concentration above the limit for Category III was periodically observed in some rooms, mainly bedrooms. The main factors affecting air quality in buildings, expressed by CO₂ concentration, are the ventilation airflow rate and number of occupants present. The buildings were occupied by people in a typical way; therefore, problems with inadequate ventilation rates were expected. In Building B, the carbon dioxide concentration exceeded 1250 ppm and indeed revealed insufficient ventilation in bedrooms: the measured airflow rates were 8 and 16.5 m³/h. In this case, the inflow of fresh air to the building was decreased, mainly during nights, and thus the CO₂ concentration increased.

1.4 Increased disease occurrence due to climate change

The global climate are the result of a complex interaction of numerous factors, characterized by a primary energy source (solar radiation) and on the other a large number of Earth features and phenomena that shape, as the composition of the atmosphere, winds, ocean currents, rain, or volcanic eruptions (Ramalay, 1940). The word climate established in antiquity from the verb incline (i.e.): Inclination of solar radiation to the earth's surface. The meaning of this gradient observed Eratosthenes (Babinjotis, 2010). And indeed it is the most important factor in shaping the climate of each area because depending on the latitude of a place, the angle of incidence of solar radiation in the Earth changes. The climate also varies with time and changes gradually over a period of decades and centuries. These changes may be due to human activity (Gupta, et al. 2011). The earth's climate is constantly changing. Experiencing only a very small act of work, we often have difficulty to understand the great changes of the Earth's climate, which is characterized by several periods of glaciations, which are interrupted by short breaks warmth and prosperous life (Kintisch, 2013). Any human intervention on the factors that shape the climate can lead to change. This fact, coupled with the uncertainty in the theoretical calculation of the effects is the main argument of the skeptic, who questions whether the same phenomenon, or the size of the impact (Randalls, 2011). The climate change and environmental destruction are considered among the most important problems of modern civilization globally. Threatened all areas of human life and the survival of all living organisms on the planet, from coral reefs to the Arctic.

Not only skin allergy, rhinitis and vector borne diseases like malaria and dengue increase due to pollution, global warming and climate change but emerging diseases are among the most profound consequences of global warming. Among others, climate change is responsible for the growing threat of new deadly viruses. The infectious diseases, with an increased frequency, include severe acute respiratory syndrome (SARS) and H1N1 flu. Changes are observed in the frequency of infections by respiratory cyclical virus (RSV). Particularly in infants and young children, RSV virus causes disease, which can range from a mild infection of the upper respiratory system up to life-threatening infections of the lower respiratory tract (bronchiolitis and pneumonia). Often, in children can cause otitis. Older children and adults usually have a

mild course of the disease but the elderly can be heavy sick. The seasonal occurrence and duration of RSV infection have already changed by the mid of 1990 (Filippidou and Koukouliata 2011). In 2006, the United Kingdom was plagued by outbreaks of Legionnaires' disease, a bacterial infection of the lungs, which scientists attributed to global warming. Great attention should be given to changing styles of diseases transmitted.

The IPCC states that climate change will lead to changes in the transmission of infectious diseases by carriers such as mosquitoes, due to changes in their geographical spread. Rising temperatures will also increase the risk of certain transmittable diseases, which previously appeared only in the tropics or in very hot countries. Mosquitoes and other carrier's insects of such diseases can be moved to a higher location, in case the temperatures permit it. This may bring population, like this from our country, in contact with diseases which previously had never encountered. Malaria is one of the first diseases to which different populations are at risk as a result of carrier's migration in their geographical area (Patz, 2005). Recently, in west, the incidence of malaria increased. The infection caused by *Plasmodium falciparum* is the most dangerous form of malaria, causing severe respiratory problems. The potential increase of malaria risk in parts of Europe was investigated with various models. Although, it is difficult to make accurate predictions, but there is a consensus that the overall risk of malaria transmission due to local climate change is very small, especially when there are adequate health services and good management of mosquito control.

The humid, rainy season and warmer temperatures are giving mosquitoes and ticks to reproduce more, spread diseases, and expand their habitats. Nine new germs spread by mosquitoes and ticks were discovered or introduced into the United States during 2014 to 2015. The geographic ranges where ticks spread Lyme disease, anaplasmosis, ehrlichiosis, and spotted fever rickettsiosis have expanded, and experts predict that tickborne diseases will continue to increase and perhaps worsen. Longer, warmer summers have also given mosquitoes more time to reproduce and spread diseases. In 2012, a mild winter, early spring, and hot summer set the stage for an outbreak of West Nile virus disease in the United States, resulting in more than 5,600 illnesses and 286 deaths.

Animal species have to search for new habitats in changing climate as their natural habitats disappear, and it has expanded the habitats of other animals. The spread of zoonotic diseases may occur due to movement of animals into new areas and contact between humans, as these examples show:

- Wildlife carrying the rabies virus are expanding to new geographic areas of the country.
- Arctic temperatures are rising more than twice as rapidly as the rest of the world. Warming temperatures in Alaska have led to increases in vole populations, which can spread diseases like Alaska-pox to humans.
- As global temperatures rise, deadly diseases that are a threat in other countries – like Ebola, Lassa, Rift Valley fever, and monkey-pox – will increase along with the risk of them being imported into the United States.
- Rising temperatures have allowed certain disease-causing fungi to spread into new areas that previously were too cold for them to survive. For example, Valley fever – caused by a fungus that lives in the soil in hot and dry areas – has already spread into the Pacific Northwest.
- As the difference between environmental temperatures and human body temperatures narrows, new fungal diseases may emerge as fungi become more adapted to surviving in humans.
- With the increases of the risk for flooding, the fungal growth may occur in homes on organic substrates like wooden doors, windows, cotton cloths and curtains.
- During rains fungi may cause skin diseases.
- Certain fungi can cause deadly infections of the lungs and brain.

1.5 Changes in Lifestyle

Routines People who were working full-time missed on the family time, leisure and fun activities but with the lockdown in effect they have started changing their routines - Enjoying all three meals with the family,

catching a short nap occasionally, playing with pets and engaging in evening games with the family. First they were in panic mode but slowly started managing the workload along with enjoying the family time. Everyone is free to twist, turn and bend their schedule to their own comfort level. But sometimes work takes up more time than generally in the office. The management becomes easier and the things are solved faster when you are face to face with the situation in an office or an industry. With the opening of lockdown the industries and offices are working with maintaining social distancing till further orders. Many offices has allowed work from home and many big multinational are in a mood to adopt it as new normal and this will relieve them of heavy office expenditures

People are giving enough attention to some physical exercise or yoga to get body relaxed and fit. Some people started regular evening prayers at home. Because of closedown of parks and gyms a large number of persons related to sports were unable to do their daily practice. Even the Olympics scheduled to be held in Tokyo, Japan were postponed. This new condition may compromise maintaining a healthy and varied diet, as well as a regular physical activity. For example, limited access to daily grocery shopping may lead to reduce the consumption of fresh foods, especially fruit, vegetables and fish, in favour of highly processed ones, such as convenience foods, junk foods, snacks, and ready-to-eat cereals, which tend to be high in fats, sugars, and salt. Moreover, psychological and emotional responses to the, may increase the risk of developing dysfunctional eating behaviours. In order to contrast and respond to the negative experience of self-isolation, people could be more prone to look for reward and gratification physiologically associated with food consumption, even overriding other signals of satiety and hunger(Singh, 2014). On the other hand, negative experiences may lead to eating restriction, due to the physiological stress reactions that mimic the internal sensations associated with feeding induced satiety. Finally, lifestyle may be substantially changed due to the containment measures, with the consequent risk of sedentary behaviours, modification in smoking and sleeping habits. Of interest, different studies reported an association between sleep disturbances and obesity due to increase the secretion of pro-inflammatory cytokines by the increased visceral adipose that could contribute to alter the sleep-wake rhythm.

1.6 Changes in food habits and Human health

Eating habits and lifestyle modification may threaten our health. Maintaining a correct nutrition status is crucial, especially in a period when the immune system might need to fight back. Obesity is an expansion of the adipose tissue, which produces cytokines and contributes to a pro-inflammatory milieu (Hauer, 2005). Moreover, in regards to pulmonary physiology, subjects with obesity have decreased expiratory reserve volume, functional capacity and respiratory system compliance. In patients with high abdominal fat, pulmonary function is further compromised in the supine position by decreased diaphragmatic excursion, making ventilation more difficult.

Scientists have found that besides routine food crops like cereals and pulses the other crops like millets and pseudo-cereals are nutritionally rich and can form an important component when crop failures occur. The famine conditions were recorded in Ireland (due to failure of potato during 1845-49) and Great Bengal famine (due to loss of paddy in 1770). Great Botanist William Roxburgh had suggested the road side plantation of fishtail palm (*Caryotaurens* L.) to the Governor of Bengal. As the stem pith and seeds are edible and can save the man from death due to hunger. We consume lot of coconut but leaves of fishtail act as fodder and in scarcity we can eat the stem part of fish tail palm was not known to many of us. In Indian villages people consume dried flowers of *Madhucaindica*, fruits of ber (*Zizyphus* spp.), date (*Phoenix dactylifera*L.), tamarind (*Tamarindusindica* L.), plum and peach (*Prunus* spp.) etc. A large number of spices are obtained from trees and seeds of dry fruits like charoli (*Buchnanialanzan*Spreng), chilgoza (*Pinusgirardiana*Wall. ex D. Don), walnut (*Juglansregia* L.) and almond (*Prunusamygdalus*Batsch.) and certain others are nutritious and relished by one and all. There is a need to change our food habits besides clean air and clean water to keep ourselves healthy we should include fruits, vegetables, mushrooms and micronutrients like Ca, Fe, Zn and vitamins. Healthy foods should be given priority over fast junk food. Regular utilization of seasonal fruits can save us against hazards of air pollutants.

Use of mushrooms can improve the availability of protein rich vegetarian diet. Nutritional potential has long been overshadowed by the well-known cultivated mushrooms such as *Lentinusedodes*, *Pleurotus* species and *Agaricusbisporus* (Arya and Arya 2007). A high biodiversity of wild mushroom biota is found throughout the tropics, particularly sub-Saharan Africa, with about 300 edible mushroom species (Nakalembe et al. 2015). *Termitomyces* are said to be superior to all other mushrooms globally because of their biting aroma (Singer 1962), the genus has a symbiotic relationship with termites (Heim 1958).

1.7 Use of medicinal herb to keep body fit

Strategies have been suggested to reduce the ill effects of air pollutants and keep ourselves healthy by the inclusion of Ayurveda system of medicine and consumption of medicinal plants like *Tinospora*, *Trigonella*, Turmeric, Shatavari and Tulsi in day to day life. Giloy or *Tinospora* can cure cough and fever, *Trigonella* is good for diabetes and satavarins are present in the *Asparagus* or satavari, which is good as tonic, ginger and termaric have antibacterial and antifungal properties and *Ocimum* or tulsi has many medicinal uses. *Aloe vera* is used in face creams and soaps as it is good for our skin.

1.8 Rediscovering Connections with Family and Friends

The family and friends connections have only grown deeper and deeper day by day the lockdown has started. All the zoom call, Google meets, video calls and conference calls with hours and hours of gossip was part of daily routine. Chatting and playing with your cousins over online games and enjoying with your relatives over cooking competitions were considered as the new way of stepping into a new path of togetherness. The family time increases increasing the bonds of affection, love and care. All the daily activities are now the fun tasks of the day creating memorable memories and tasty dishes to last a lifetime. The sibling prank wars to miss your conversations, the twinning to the arguments over who wins the race to the remote, all the precious moments are relieved. Doing all the things that was once not possible due to gogo-go time - the busy schedules was practiced on daily basis. "To reminisce with my old friends,

Reminiscing old memories are valuable experiences for the future generations. It preserves family history, bring families closer together, helps improve their quality of life, reduces symptoms of depression and increases self-esteem, promotes physical and mental health and also help to lower blood pressure and heart rates, works through unresolved conflicts to live a healthy present, eliminates boredom providing laughter and entertainment, improves communication and as well as reduces stress. Flipping through the old albums and pictures, watching favourite movies, relieving holidays, traditions, enjoying your choicest foods, playing favourite songs etc. all these helped to relieve the special moments and made the moments memorable for ever.

1.9 Yoga and Self Care or Healthy body

Yoga is one such process that affects not only physical health but also mental state. It is estimated to be a 5000-year-old discipline originating in India (Shankar 2010), which includes various asanas, or control of posture, and pranayamas, or breathing exercises. One of the most widely used breathing programs derived from yoga is SudarshanKriya (SK) (Janakiramaiah et al., 2005). It is a set of breathing techniques taught by the Art of Living Foundation. Sudarshan is a Sanskrit word; Su stands for "proper" and darshan means "vision." Kriya is a yogic practice that is meant to purify the body; thus, SK is a simple breathing technique that harmonizes the body and mind. In addition to breathing techniques, it emphasizes the importance of prayers, asanas (yoga postures), and meditation. SK has 4 components. The practitioner's eyes are kept closed through all the components. The first and second components are done in vajrasana (ie, sitting with the legs folded and the spine erect). The first component is a 3-stage pranayama, with Ujjayi breath and specific arm positions. Ujjayi is a slow and deep breathing technique, done at the rate of 2 to 4 breaths per minute with a specific ratio of inhalation, exhalation, and breath holds. The second breathing component is Bhastrika, done with vigorous and faster breathing at the rate of approximately 20 to 30 respiratory cycles per minute. Up-and-down arm movements are used to increase the force of inhalations and exhalations. After

Bhastrika, the sitting posture is changed from vajrasana to sukhasana (i.e, sitting with the legs crossed). SudarshanKriya has many physical and emotional benefits. These breathing techniques have the potential to relieve anxiety, depression, posttraumatic stress disorder (PTSD), chronic pain, and many stress-related medical illnesses. In addition, it may be useful in treatment of behavioural disorders because they generally are linked to stress. This is a time of incredible anxiety and stress. Focusing on what makes us feel nourished, on what gives us meaning, and is part of easing those feelings and giving us a more solid foundation. Self-care includes myriad practices that you find both enjoyable and that in some way promote your physical, emotional, spiritual, or mental health. Prioritizing sleep, working out, intuitive eating, high protein snacks for an energy boost, keeping stress busting foods on hand, whipping up a healthy mock tail, practice positive self-talk, practicing breathing focused meditation, chilling with music, crawl up on the sleeves of creativity, enjoying a home spa etc. all this helps to revitalize oneself.

1.10 Conclusion

Pollution and climate change has changed our routine. Now we feel more stressed. Regular physical exercise is needed and we should keep our minds mentally free from day to day stress. Yoga is to be practised by all of us. A regular meditation exercise is required along with yoga. Use of regular walking, cycling or swimming and joining the laughing clubs can do wonders. Food habits are to be changed to healthy and nutritious. We should reduce the use of mobile and electronic gadgets and try to spend good times with family and friends. The family time helps to reduce the stress as is the practice of meditation. Conserving our cultural heritage and ancient historical monuments is equally important. Regular monitoring and preventive measures should be taken by people and government agencies like ASI. Plantation can be done to reduce the pollution load in cities and this will help to maintain the proper humidity and temperature.

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