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Effect Of Climatic Variations On Immune System

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Abstract:*Generally climatic variability considered relatively as climatic factors which are directly or indirectly affect the human life. The simplest explanation for this is that global warming increases the mean of temperature but the overall shape of the climate distribution remain the same. Hence, the maximum of the distribution shift towards the warm region. On the other hand a change in the mean without a shift in the location of the maximum. If distribution condition would change in such a way that like hood of cold days is reduced as compared to the warm days. These changes in live distribution due to the climatic changes, the different physiological activities as well as metabolical reactions mostly affected by the climatic variationsand create another genetical problem (develop by mutation) and immunological diseases in humans.The immunological changes may occur by some climatic factors temporarily or chronically and generate the syndromic or non- syndromic problems in community of our surrounding.*

Keywords:Global Warming, climatic changes, immunological changes.

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I. Introduction

There is a need in atmospheric environmental science to obtain a measure of the degree of environmental conditions surrounding an organism or group of organism especially. Environment is a combination of physical as well as chemical conditions that affects and influence the growth, development and survival of the organism[1]. A pollutant is any substance in the environment which causes objectionable affects impairing the welfare of the environment, reducing the quality of life and may eventually cause death finally. It may be air, water and soil which cause the climate change easily. The studies of the climatic change have shown that global surface warming has been taking place and global annual land mean precipitation showed a small, but uncertain[2].

However, climatic change has not been globally uniform. There are very large differences in the change of air temperature and precipitation. The greater Himalayan region is highly sensitive to global climatic change. Which is covering the area of all high mountain chain of central, south and inner Asia including Hind Kush, Karakoram, Himalayas, High Altitude Tibetan plateau[3]. This region play an important role in global atmospheric circulation, biological diversity, water resources and hydrological activities apart from the beauty of its landscape and ecosystem amenities[4]. The climatic changes like melting glaciers, water sources of 1.4 billion people is about 10 large river basins in Asia have a negative effect on water supplies as well as living conditions and this region is considered as potentially the most critical region in the world.

Therefore, a lot of earlier studies on climatic change in the Himalayan region shows that most of them are concerned on the Indian and Nepalese Himalayan[5-8]and the Tibetan Plateau[9-10]. The climatic change do not only make great impact on glacier melting, water resources, natural hazard, animal husbandry, forestry, agriculture as well as live hood but also the food production, respiration, ecological balances and immunological changes in human beings along with animal system.

Although, Antarctica is one of the most remote places on earth, its climate and possible change potentially have strong global impacts. For example, the sea level could rise worldwide by about 3m if the climate was to warm sufficiently. Especially, the maritime west coast of the Antarctic. Peninsula has some of the most rapid warming worldwide. In last five decade at Faraday/Veriadsky stations and Gomez ice core area have great evidence for significant warming of Antarctic region[11-13] as about 0.6 C/ decade. Presently the magnitude of extremely cold temperature has reduced while there is no evidence of an increase of the annual maximum temperature at Atlantic region.

Similarly, the cold temperature at great Himalayan region decrease whereas the worm temperature increase due to the global warming, which influence the total biological diversity world widely[14]. It has been reported that a significant increase in an air temperature over the north-west Himalayan region by about 1.6^0C in last century. Dash and his co-worker describe an increase of maximum temperature 0.9^0C in western Himalayan and 0.8 I North-Central India during last century and also sharp decrease in minimum by 1.9^0C in western Himalayas, 1.1^0C in North Central during 1955-1972[15]. While, it also has been observed that the in monsoon and post

monsoon season, the maximum temperature increased in northeast Indian Himalayan region because Indian summer monsoon is a major component in the Asian monsoon system[16-17]. The rainfall observed during this period contribute 70-80% of the annual rainfall and play an important role in the water resources, agriculture practices and power generations.

However, Ozone level (tropospheric) above and around a site may contain ozone and the precursors with different origin, regionally or globally from natural or anthropogenic sources that change over time. The ozone level process is a photochemical smog process which formed by purely natural process. Due to the climatic changes which occur by air, water and soil pollutants i.e. different toxic elements (Co, Co_2, So_2, NO, No_2, Pb, As etc.), radioactive molecules and electronic wave emission, satellite launching gases, substances etc., causes the global warming conditions in the clean environment[18]. There are a large numbers of cyclone on different region which characterized the genesis and lysis of cyclone, their trajectories and duration intensity etc. directly affect to the surrounding climate[19-21]. Some time it may be small size and cannot captured in above climatology. Where as in satellite picture of cyclone which exhibit a circular eye surrounded by a convective eye ball and roughlyaxisymmetric cloud pattern, these cyclone development is clearly affect to the climate conditions and also influence the life present on the earth[22].

The climate changes and rise in temperature are considered as the key factors to develop the vector born disease e.g. malaria, viral, bacterial, fungi etc. The global warming and climatic changes due to the air temperature, air pressure and increase in surface temperature on greater Himalayan are likely to causes the severe metabolical and physiological problems in community. The ozone level concentration disturbance create a harmful physiological affect which leads towards the syndromic as well as genetical/immunological problems in human body[23]. There are so many workers have been evaluated the vector born scenario due to such problems globally. WHO and other organization have observed that about 350-500 million malaria cases develop annually. Out of that about 60-70% cases were found in south Asia. Where as in India, about 5-6 lakh persons found lost their live due to the malaria annually. The trends in data identified using the parametric or non- parametric method e.g., Mann- Kendall test method for non- parametric identification. Similarly, the other bacterial, viral, fungal or allergical problems develop due the climatic changes and directly affect to the body immune system in living beings. The climatic variability considered relatively as climatic factors e.g., temperature, rainfall, rainy days, relative humidity, air gases develop in the form of pollutants/ substances/ toxicant, radiations, electronic emission etc. are directly or indirectly affect to the human body and create several health related problems which occur by some mis-metabolism. In this context, the mode of adaptation process occursaccording to the weather/ climate and need of surrounding atmosphere by an individual is considered in present study. Geographically, in plain area of Indian region of Himalayan basin, the hydro-meterological data as well as vector born problem data including with some allergical diseases which create and develop another immunological changes in human beings also considered. The present study would highlight the physiological, pathophysiological scenario of chronic and syndromic/non-syndromic, immunological diseases in our communities and help to control such problems develop due to the climatic changes globally.

II. Material and Methods

The different climatic data and their relative factor have collected at different geographical conditions during different seasons i.e. in winter, spring, summer and rainy seasons. The relative non- living or living data which are affected by these climatic conditions also collect along with vector born problems. The different motor vehicle pollutant/ toxic molecule are also considered in present study.The relationship between climatic factors and geographical variables of cold and warm regions which are directly or indirectly affect to the physiological/metabolical phenomena of human beings also considered. We have tried to observe the response of malaria transmission through the climatic changes in the arid region. Mostly the malaria parasite spreading fore casting basedon meterological parameters such as pressure, air temperature. Wind flow, relativehumidity, monthly maximum air temperature, minimum air temperature, evaporation, sunshine conditions etc. have also considered to evaluate the present study. Different diagnostic parametersdata of affected persons by vector problems and their antigen / antibodies values were collected and analysed to observe the incidence in human physiology.

III. Result and Discussions

The trends in incidence of climatic changes in Indian geographical condition and vector born disease i.e. viral, bacterial, fungal, and malarial problems occurs due to the variable atmospheric temperature, wind flow, humidity, rainfall, deserters and altitude factors were observed throughout years. These factors affected directly to the human life as well as to other animal. The value of these climatic factors (temperature, rainfall, relative humidity, annual season at different geographical places) in Indian hemisphere are directly correlate to the living system and affect to the entire physiological as well as metabolical condition i.e. oxidation/ reduction) and create different immunological problems. There are so many harmful disease occur due to these climatic changes seasonally as well as annually. The vector born disease e.g. malaria, mostly spread in desert and heavy

rainfall area at large[23]. The severe chronic malarial problem develop another physiological problems such as cardiovascular, tuberculosis, diarrhea, meningitis, chikungunya, dengue fever, encephalitis, neural problem, ratino pathological, renal etc. in human beings.

The total leukocyte counts of affected persons did not show any significant change in their value as compared to the normal value during seasonal variation except in rainy season. The platelet counts were found decrease in comparison to the normal value for the period of August to January i.e. rainy (0.95L/cmm) and winter season (1.62). During winter and spring season (November to April in present study) the eosinophilic count of different affected person were found increase in comparison (upto 12 % in winter; 14 % in spring) to the normal value (3-5%).It may occur due to the humidity and pollen migration through wind flow and air pressurein the environment. Different observed biochemical parameters s.calium.; S. creatinine; and blood urea did not influenced by the climatic significantly. The observed alanine transaminase value were found normal except in spring season (55.0 unite/ml). Whereas, during this period some immunological parameters e.g. NS1 represent the reactive stage and IgG&IgMantibodies did not show reactive stages (non reactive) except in few cases. The platelet count, total leukocyte and red blood cells were foundslightly decrease in comparison to normal value, it may be due the vector problem(malarial effects as well as some viral/ bacterial etc.).Generally, the physician make a diagnose of dengue fever while it is not a confirm test to make such problem. Further antibody/ antigen test require to confirm such problem in community. The decrease value of red cells is a clearly indicate the hemolysis of red cells may create the hemolytic anemia and hemolytic joundic and other hepatic as well as renal problems. The body inflammation, oedema water retention, respiratory, cardiothoracic problems may also develop chronically due to the Plasmodium falciparum(a vector born problem)biting.

During the seasonal variation, the different pollen grain (plant material) spread through wind flow and create some allergic problem and influence the physiological activities. In circulatory system some leukocyte cell physiology disturbed e.g. eosinophilic count, neutrophilic as well as lymphocyte cells count & other condition changes and immunological problem occur. For example ENT problem i.e. sinocytis, glumerritis and acute eosinophilic allergy create/ develop in human body which may be harmful and finally result in death at large. These eosinophilic cells disturb or affected to our body immune system and IgG, IgM antibody and antigen develop temporarily or at chronical stage develop some syndromic as well as carcinogenic problem in human body[24].

Although Indian summer season is a major component in the Asian monsoon system and rainfall obtained during this period, contributes an important role to spread the vector born diseases. Dengue fever, chikungunya, filaria, malaria and viral disease occurs and different immunological problems develop at first stage. At chronic stage of malaria and filaria, secondary characters develop such as respiratory, circulatory, renal and cardiothoracic problem occur and body inflammations, odema, water retention, jaundice, rheumatic joint pain, hepatic problem develop slowly-slowly. Various physiological and biochemical reactions takes place in human body during climatic variation and cloud thunder-ness(during rainy season). The different wavelength radiations of these climatic alterations may changes the genetic material as well biomolecule (C,H, N,O) and may develop the oxidized or free radicals in human body. These physiological/biochemical reaction directly or indirectly affect to the immunologicalsystem in humans.

During the long term or chronic malaria, cerebral malaria (CM) / meningitis may occurs which is a major life threatening complication of *P. falciparum* infection which is responsible for up to 2 million death annually. It is likely that the multiple mechanism are involved in the induction of cerebral complications and both the presence of parasitized erythrocytes in central nervous system (CNS) and immune-pathological process contributes to pathogenesis of cerebral malaria. In this process the degree of immune activation and degeneration of galial cells was shown to reflect the extent of neurological complication in murine cerebral malaria in which thecytokines product secreted in the development of cerebral malaria[25]. The body T-cells appears to be central to both malaria immunity and to the manifestations of cerebral malaria.The T-cells in body immunity accompanied by many functions and it include migration of activated T-cells from the peripheral blood to the spleen and liver. The activation of $CD8^+$ suppressor cells and defect in the production of IL-2[26].

During the chronic malarial conditions, monocytes and macrophage invalue in human immunity and hepatomegaly and splenomegaly conditions develop due to murine and malaria infection in human being and have been attributed not only to erythro-phagocytosis but also to increased numbers of macrophages recruited from the circulation[25].

An effective immune response involve two major group of cells i.e. lymphocyte and antigen presenting cells. The lymphocyte (B-lymphocyte and T-lymphocyte) produced in bone marrow by the process of hematopoiesis and circulate into the blood and lymphatic system and reside in the various lymphoid organs. They produce and display an antigen binding cell surface receptors, which attribute the immunological specificity. B-cell mature in bone marrow and release a unique antigen- binding receptor on its membrane. Whereas T-cells also arise in bone marrow and migrate to the thymus gland to mature. The mature T-cell also express a unique antigen binding molecule i.e. two T-cell receptor(TCR), one is T-helper (TH) and T- cytotoxic(Tc)cells. Both Th&Tc

can be distinguished from one another by the presence of eitherCD4 or CD8 membrane glycoprotein on their surface[27]. Unlike, B- cells membrane-bauntantibodies(Ab), most T- cells receptors recognize only antigen a major histo-compatability complex(MHC) molecule. The antigenic specificityof each B- cells as determined by membrane bound antigen binding receptors i.e. antibody, is create encode the Ab molecule. The Tc cell respond to antigen by developing cytotoxic T- lymphocyte (CT-cell)which mediate the killing of various infected cells[27]. During the malarial infection at chronic stage, these T-cells affected and may change the immunity of affected person. According to the pathogenesis, an important concept of virology in relation to the carcinogenesis is that a viral infection can include neoplasia, not by acting as a persisting injurious agent in affected cells but by the inducing change in the genetic nature of the cells, after which the virus, as an infectious agent may disappear from the cell and malignant information has been induced which may be DNA type i.e. Polyoma virus or RNA type i.e.RausChikenSarcom Virus[28].

Similarly, the toxicant molecule/pollutants affect the human physiology which create the another harmful problem e.g. anemia, which occurs due to the heavy content of Co (Carbon Monoxide), Co_2 (Carbon dioxide) and also certain free radicals develop during mis-metabological condition in human body. These free radicals also contribute a major role to develop the immunological problem/disease. Chronically, it may be convert in to syndromic problem as well as hereditary problem. These free radicals which is a molecular fragment with an unpaired electron in it outer orbital ring, causing it to be highly oxidative unstable and react instantaneously with other substance, create an aberrant compound in human body. Their half-life of these biological active free radicals is measured in microseconds[29]. These free radicals developed in human body , tissue, causes harmful effects of energy ionizing radiation, for example ultraviolet rays, X-rays, gamma rays, nuclear radiation, cosmic radiation, electromagnetic radiation, satellite launching gases etc. when photon of radiation knock electron out of orbiting pairs. Theses rays or emission and ionizing radiation is a climatic changes factors which are directly affects the climate and also create several problemsfor threating of life globally. The presence of free radicalsin cellmembrane produce damaging lipid peroxidase, oxyarachidonate and oxy-cholesterolproducts[30,31] which contribute to atherosclerosis problem and is toxic to human life. We can say that the development of free radicals due to the mis-metabolism during climatic change(occurs by different factors and manmade conditions)influence the human physiology create the several syndromic, non- syndromic as well as immunological problems.

Geographically, climatic changes i.e. cold and warm region (minimum and maximum air temperature) also contribute and influence the body immunity and disturb B- cells & T-cells of human body. The human body inflammation and some severe allergical conditions develop due to the pollen grain activation during winter to summer season and temperature variation, wind flow, humidity also create the certain immunological problems. The eosinophilic counts of human leukocyte cells activated the body immunity and develop severe harmful disease which may cause the death if proper treatment not applied. Most of the allergic reactions develop due to the weather changes in human are not rapidly fatal. Allergies and asthma are a result of inappropriate immune response often to common antigen such as pollen grains, food, certain hypersensitive substances or animal toxins etc. a specific allergy or anaphylactic response usually involve a type of antibody i.e. IgE (immunoglobin E). In which a specific antigen (allergen) release substances causer irritation and inflammation. Similarly, an allergen exposed to the sneezing wheezing, difficulty in breathing asthma, dermatitis or skin eruption etc. in human occur due to climatic changes. In certain individual, the immune system malfunction (physiological disorder) by losing its sense of self and non- self, which permits on immune attack on the host, i.e. auto immunity which causes a number of chronic debilitating diseases due to the climatic variability and biological agents also. The severity of auto immune deficiency depends on the number of affected components which may be create by climatic change. In this context, a rarer immune deficiency called severe combined immune deficiency (SCID) which affect to the both B & T- cells and may results in death from infection at an early age if untreated[32].

During chronic malarial condition, certain macrophages cells i.e. kuffer cells in liver, messengial cells in kidney, microglial cell in brain, osteoblast cells in bone, histolytic cells of connective tissue etc. are disturbed and their physiological reactions and auto immune system i.e. B & T-cells disorder which create a severe immunological problems in humans. The different granulocyte counts (neutrophils, eosinophil or basophils) i.e. polymorpho nuclear leukocyte cells disturbed due to the weather changes geographically as well as food, air pressure, air temperature altitude conditions, electronic wave emission, radiological emission in the environment. All these climatic affected factors directly or indirectly influence the body immune system and create severe problems. The neutrophils comprise over 95% of circulatory granulocyte and have a large arsenal of antibodies proteins, detensins, seprocidins, cathelicidines and bacterial permeability inducing (BPI) stored in two main granules i.e. lysosoma contains acid hydrolases, myclo- peroxidase and muramidase and secondly lactoferrin and lysozyme. The neutrophil can release a cytotoxic substances extracellularly when they are activated by immune complexes through Fc receptorthrough a pathogenitic mechanism in immune complex diseases. Similarly, monocyte and eosinophil play an important role in human immune system. Eosinophil comprise about 2-5 %of blood

leukocyte in healthy-non-allergic individuals and contain major basic proteins (MBP)which is a potent toxin and activate neutrophil and platelets and relevance to allergy, provokes bronchospasm i.e. eosinophil play a specialized role in human immunity mechanism[27,32]. The platelets cell also influence during climatic variation and involved in immune responses especially in inflammation conditions. It express a receptors for IgG (CD32; Fcy RII) which are activated through IgG immune complexes. In addition to this factor in which GPIIa complex (CD41) responsible for binding to fibrinogen, fibronectine, vitronectine and vonwillbond factors[27].

IV. Conclusion

The climate changes is a major component to survive the life globally. The different climate factors influence the physiology of living or non- living things and may develop many harmful disease e.g. immunological which leads toward the certain immune- pathogenesis problem in our community. The different geographical conditions directly influence the life. The several vector born problem occur due to the climate variation seasonally or annually. The global warming condition develop by the different pollutant/ toxicant, which are manmade or naturally globally affect to the ozone layer directly. These changes in ozone layer condition is another factor of climatic changes which leads to several vector born disease (viral, bacterial, fungal, malarial and bio chemical) and help to generate the immunological problem in human. The different allergical disease, cardiothoracic, respiratory neural genetical renal problems may occur at large chronically by the immunological changes (develop due the climatic variation) in humans and may cause death if proper treatment not follow.

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