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Geographical Factors in Medicine and Human Settlements

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Abstract: Medical geography is the influence of environmental (natural and human) factors on biological system of human, plant and animals which is even recognized as an effective and basic factor in mortality. Geography is a hybrid science, a science which generates its components. If we take geography in association with the definition of human and environment and its reciprocal relation in such a way not to damage the environment, will it be possible to reveal that it is hybrid and that how wide is it? Yes, it has been extended as equal as the whole living environment (life layer) of human and living things as well as non-living things. While examining the various topics and concepts of environmental factors and medical sciences in the study of geographical factors including environmental and human factors, in present research it has been attempted to deal with the investigation on its effect in medicine as well as the conditions under which the human settlements were formed as a history. In this way, we will be able to have an insight into the settling of new settlements and/or to physically develop other settlements including urban and rural environments and even to consider this case in modifying of the existing spaces. Medical geography, in addition to involving in various environmental factors, considers the diffusion of different diseases in various geographical locations and continental conditions and also, this science acts to timely prevent such situations as they are obstacles in the process of stable development.

Key words: Geography, medicine, human settlements, environmental factors

INTRODUCTION

Since when the geography significantly and effectively contributed to medicine and health, all of these three sciences benefited from the cooperation. Geography, in terms of its function, implanted another seed, the yield of which was this newly-emerged science. Taking advantages of this new science, medicine and health reach wonderful explorations in the fields of the occurrence of pathogenic agents, influence of geographic factors on the appearance of pathogenic agents and the rate of their impact on disease spread (<http://www.who.int/publications/en/>).

The manner and the type of human predominance over the Earth and the methods he chooses to apply them as well as the natural richness or deficiency of the Earth and in general, natural susceptibilities of the region have deep effects on nutrition quality and quantity, health, hygiene, kind of disease and individuals' life-span. If we think of the interactions between the aforesaid conditions and factors and would arrange to measure the relations in qualitative and quantitative respect, we will reach the concept of medical geography.

The old saying as "To travel from one region" which refers to getting sick because of changes in settlement

and climatic conditions is a proverb showing the impact of geographical conditions on human body and its role in pathogenesis (Annis, 1981).

Diseases and medical geographical insight aged several thousands of years. According to Hippocrates (5th century B.C.), the father of medicine (Chaklin, 1981).

"Everyone who is in seek of the art of medicine, first of all should think of seasonal influences and then, to gain knowledge on the effects of hot and cold winds and water quality and at last he will have to examine about green and lush spaces" (Haddock, 1981). Though these geographical insights have a very long record, the term of medical geography aged less than a century. This branch of geography is very young and requires more information be obtained".

DOMESTIC AND OVERSEAS COMMENTS ON MEDICAL GEOGRAPHY

In Iran, the first geographer paying attention to medical geography was Mr. Hossein Shokouei, at the Department of Geography at Azarbadegan (Azerbaijan) University. In 1975, he published a remarkable essay titled: "Medical Geography and its Methodology of Research" in the press issued by the Faculty of Literature and Humanities of the said university (Ganji, 2001).

The late Dr. Ahmad Mostofi, formerly professor of geography at Tehran University, in his book under the title of "General Geography" has described the function of the geography of diseases as follows: "Different regions on the earth in accordance with natural conditions are appropriate to get some diseases and in the said regions the physician may specify the disease distribution location based on their full identification on climate, elevations, reliefs and people lifestyle".

And Dr. Zartosht Hoshour in his book titled: "Introduction to the Medical Geography of Iran" presents his view based on the opinions made by domestic and foreign advisors in this respect:

"Medical geography is a subdiscipline of human geography highly affected and constrained by natural geography (totally and generally) in all perspectives. This field of geography is dealt with the impact of natural factors (weather; intensity and direction of wind; sunshine; natural radioactive radiations; regional elevation; texture, quality, composites and components of soil, vegetation and various microorganism and macroorganism living things, water quality and quantity) on human body and this generality is a characteristic feature of geography".

Followed by his works, a retired assistant professor of Esfahan University, Dr. Mahmud Mohammadinejad, also make investigations on the impact of iodine deficiency in Sistan-va-Balouchestan Province of Iran.

Dr. Jack May considers medical geography as "the study of relationships between pathological events and environmental factors".

And James Benta defined medical geography as:

"In geographical literature we encounter with different concepts on medical geography including medical ecology, geographical pathology, planet epidemiology, global epidemiology, ecology of diseases and sometimes human ecology".

Mack Gloschen says: "Medical geography discusses about the influences of different factors on health and disease".

According to Melvin Hue: "Certain diseases are spread in certain geographical areas and affected by geographical characteristics" (Johannessen, 1981).

CLIMATE'S ROLE IN MEDICAL GEOGRAPHY

The term of Meteoropathologic referring to the effect of climatic factors on human body has an intertwined and extensive concept. Several factors make regional climate; whatever geographer states as weather, in fact, is a kind of climatic events e.g., wind, precipitation, cold and heat, moisture, air pressure, evaporation, thunder and lightning,

climatic revolutions, sun shine and radiation, which is a wrong translation of Meteore, but since this term, though wrongly, is integrated in Farsi and even in scientific language and any one speaking on weather, depending on his/her familiarity with this knowledge, somehow means Meteore, it may be used considerably.

As we know, climatic factors are a product of interrelated effects of sun and atmosphere and the strength and weakness of climatic events in any geographical region is due to its latitude, elevation and distance from sea. In other words, sun is the main factor and the latitude, elevation and distance from sea ... are intermediate factors and also, the climatic events are the effects resulted from this system.

There are many theories on the existence and/or non-existence of a relation between climate and human physical, mental and living abilities. One of these theories is about the energy discrepancy between races living in diverse climatic conditions and regions. The followers of this theory believe that the people living in tropical regions, compared to those living in temperate zones or cold areas, use lesser oxygen, has a lower blood pressure and as a result, has a lower susceptibility to resist events (Kearns and Moon, 2002). Even some psychologists believe that diverse climate may cause people to grow with different moral and mental ability (Mathoulin and Haerle, 2005).

Though the above theories are currently regarded extremist and false and are not taken into account, it has been clear that the health is related with many climatic events and geographical conditions and such a relation is so recognized and sensible that a particular subdivision of medicine, namely Meteropathology has been taken into consideration by researchers (Mathoulin and Haerle, 2005). These relations are not a new finding and the climatic conditions have been determined as factors effective on health or disease at the time of Socrates. But, since long the main problem was the knowledge on how and why these relations exist as well as on how to find ways to prevent their adverse effects on human body (Prothero, 2006).

As an example, it is worth to name some diseases caused by climatic conditions as follows:

Respiratory diseases e.g., Asthma, bronchitis, skin cancer, rheumatism, cardiac diseases etc.

Now, it is necessary to deliberate the concept of climate somehow more accurately (Mathoulin and Haerle, 2005).

Firstly, in definition of climate as token, climatology is a science seeking the expression and description on the nature of climate and also, on how it has been altered upon dispositions and also, how it links with human

activities. This science is thoroughly and continuously associated with meteorology and discusses about climatic daily changes and the results thereof. It should not be neglected that at ancient times, climate was referred to continents and later, in next eras, to a quarter of the earth. and briefly, the general concept of climate means weather.

Since, climatic conditions are variable and discrepant in different regions, the elements of climate whether affect different conditions or take effect from different conditions, create abundant life layers which are the habitats of various living things, plants and even human that show consistency and or inconsistency against climatic conditions. Here if we have a look at the two definitions of climate below, that is:

Whether is the immediate and transient state of atmosphere at a specific spatial location and climate is the mean atmosphere during a defined period of time, it will be well demonstrated that different climatic conditions, in addition to other elements effective on climate e.g., water, sometimes can make various effects on living- and even non-living things like soil in the settlement so that the action and reaction made against them may be variable and all above mentioned as well as other issues, any of which being a portion for a huge entire, are among those requirements that determine the role of medical geography on the influence of all these factors which, as discussed above, are the life layers endurable for living things. As we well know, equal to all climatic conditions and situations there are life layers and each of these layers required its own factors and conditions, which may result in its acceptance or non-acceptance in the settlement and the survival of living things in the said environment. A detailed description will be given under section "Medical Geography" of this chapter (Moshiri, 2006).

PLANTS ROLE IN MEDICAL GEOGRAPHY

Plant geography is involved in plants distribution and the reason of its changes over the world. This explains that biological and geographical aspects of distribution in the world is not casual, rather the needs of any plant and the situations provided for any plant in any region of the world is an effective factor in its spread. There are other factors to be added to the above-mentioned ones, including any plant susceptibility in struggle for survival (among the individuals of the same species or other species) and their past history as well (Ghorbani, 2002).

Plant geography is a biological science. Plant geographer should be aware of biological information on physiological behavior and plants' growth and reproduction mechanisms. This is closely related with

geology, climatology, sedimentology, geomorphology, botany, zoology, plant physiology, ecology and genetics. Since, mobility in plants is not so much as in animals and as they have a more specified settlement, it is easier to make a study thereon and for the same reason, as well as other causes as mentioned below, plants and plant geography forms the main part of biological geography because plants are a better index to represent their environment and also, they reflect the environmental effects better than animals because of their relative non-mobility. Moreover, the more biomass in plants leads to their having more influence on physical environment so that they provide a unique biological environment for other living things and at last but not least, plants are a source of food and energy for other living things, including human beings.

It should be briefly noted that various determinant factors affect growth and/or lack of growth in plants the most important of which are: physiographical factor or the shape of ground surface, climatic agents, soil agents pertaining to soil features and characteristic (Kardavani, 2006). They are very variable because contains many factors like physical structure, chemical composition, moisture, temperature and even living things present in soil, of which only one factor can cause or prevent the settling of plant in the settlement. Among other factors one can define whether the plant is in equilibrium with environmental conditions or not and whether this equilibrium is based on parasitism, commensal, symbiosis or competition (Asayesh and Moshiri, 2002).

Now it is necessary to have a brief summary on ecology to explain the effectiveness and efficiency of plants in the environment as one of effective factors in medical geography.

Plants are able to spread by means of their reproduction mechanisms and when the environmental conditions are suitable for their living they will be able to spread and dispense all over the earth. The extent of geographical zone of one species in which it has been settled and the extent of areas where this species have been settled in its own zone is associated with those physicochemical and biological conditions which are in consistent with its settlement. To recognize the relations between plants and their surrounding environment it is necessary to firstly examine the features of the environment with which the plant encounters and then, to study how plants react in this environment. The entire energetic, physical, chemical and biological conditions dominant immediately adjacent to plant or animal are consisted in their environment. The very environment on a certain area is called "settlement". The term of environment, in fact, determines the nature of materials

that compose the settlement e.g. aquatic, sea and ground, underground and aerial environment. Settlement is a set of many different features or factors or natures. The study on a number of factors is a subject of different sciences such as climatology, atmosphere variation, pedology, soil chemistry, hydrology and ocean logy (Ghorbani, 2002).

And finally, in view of the effective role of plants in the life of all living things and their settlement conditions, it is necessary to categorize the ecological factors in terms of two general concepts as follows:

- Classification based on environments where reactions result in basic distinguishing between aquatic and terrestrial environments
 - Atmosphere and climatic factors, temperature, moisture, precipitations, wind and gases existing in weather
 - Terrestrial factors, which is the base of plant such as temperature, moisture and soil air, physical and chemical features of soil
 - Reliefs factors, concerning with the status of mountains and earth shape which, particularly, affect terrestrial and climatic alterations
 - Biological factors explaining the reactions between living things and human interference
- Classification based on nature and function of physiological factors including:
 - Energetic factors: radiation (light and heat)
 - Aquatic factors: atmosphere water and soil water
 - Chemical factors: Free gases present in atmosphere and soil, gas and soluble substances in water, minerals and organic substances in soil
 - Mechanical factors: wind, erosion, snowfall, glacial and fire
 - Biological factors: living things functions (Kardavani, 2003, 2006).

The above factors whether adopt various effects or affect environment and its factors.

In contrary to what discussed above, plants and vegetation make productive and positive effects on the living of human, animal and other living things and in other situations, make undesirable effects on the same living things' system and organism and in other words, cause inconsistency and negative effect. The interaction among human, animals and plants in existing environment result in the generation of a life cycle, where all above living things are beneficial and effective for each other and also, this effectiveness in medical geographical perspective may inevitably result in health, balanced and normal behavior for the members of this life cycle and ring

and/or causes disease and deficiency in systematic behavior of living things, in general. For instance, the existence of different plants with pharmaceutical effect may vary with the man knowledge on their organism and/or animals' instinctive behavior for consuming them may lead to various role-playings; for example, the direct role which honey bees perceives from flower and plant, or the effects of pharmaceutical plants such as eucalyptus, matricaria chamomilla, mint, celery and hundreds of other types on humans' and even animals', recovery and health and moreover, the role the plants play in all living things', including human, dietary and vice versa, the allergic and inflammatory effects of plants directly affect immune system as well as so many other roles that plants play in human and living things' health and disease. The more the difference and variation of climatic factors and conditions influencing plants the more effect the surrounding environment and all therein will take. For instance, low rate of light, not suitable soil and salinity have direct effect on plants growth and as a consequent, on the organisms consuming them. There are so many examples to be given in this respect. These may even make unfavorable effects on organisms' genetic system in long term and/or upon modifying climate in a certain region the plant and environmental area will be improved, for example the influence of greenhouse gases or genetically interbred plants identify the positive and negative effects of this influence (Pyle, 1979).

The role of plants and their activities in settling of settlements is apparent and evident during man civilization history; the relationship of human and animals and unfairly exploitation of animals, on one hand and human beings action for supplying primary needs, on the other hand. For instance, a condition showing the role and activities of plants in the settling of human settlements and their social, economic and cultural activities is nomadic life because:

Nomads rely on pasture and vegetation. This is both related with climatic system and the quality of soil. Tundra, coniferous forests, steppes of arid zone, Mediterranean zone, tropical and semitropical, savanna and tropic forests each have its own certain faun and flora. Therefore, vegetation as well as faun and flora cause nomads to be relied on a certain system (Moshiri, 2006).

And upon considering nomadism, followed by cave dwelling, as a thoughtful movement in settling settlements, we will find that this role had been played by means of a necessary and required movement having been established among the three elements of plant, animal and man and in this respect, after transition to a in-the-mass living and the shift from livestock farming-orientated lifestyle to a agricultural-orientated one which

demonstrates the influencing role of plant in human life. This very role guides man to find areas to be settled, to make this achievement easier and the settlement alongside aquatic resources, plains; piedmonts and so on are based on this kind of planning and thinking. For instance, civilized living of Elam tribes along Karun River, considering Khuzestan plain, Moqan plain and the objective movements of nomads in Iran, lifestyle of Buwaihids, Zyarids, Buyids, Alawides in Tabarestan and the forest zone at the coast of old Gorgan (today's Mazandaran) Sea and so many domestic and overseas examples are all taken as a confirmation on the history of plants influencing in human thoughts whether in the field of economic, social, cultural and even residential activities and this thought has been realized through plants' positive and negative influences in accordance with climatic conditions.

In addition to their role on human beings and animals health and diseases, plants have other reciprocal influences on human economic and living activities as well as their social and cultural behaviors. For instance; agriculture, farming, horticulture and even silkworm breeding whether traditionally or at modern and advanced level are very effective in economic activities and they are directly related with other factors and activities which do not concern plants. Cattle husbandry farming and honey bee breeding are included in this kind of economic activities (Mahdavi, 2004).

Even the social and cultural traditions and celebrations the people of a region adopt vary for those living in a green space covered with various plants versus those living in arid areas. This effect is so remarkable that it has been integrated in Persian great poems, religious sayings ("Ahadith"), narratives and even in not-known movements entered into sociocultural movements of inhabitants. Existence of Myrtle in mourning ceremonies in Arab-residing areas of Khuzestan, existence of greenery at "Haft-Seen" table on Nowrouz (Iranian New Year traditional table with seven symbols), using plants and flowers at celebrations are some signs of the role plants play in cultural and social life of people and their traditional behaviors.

Disease caused by plants' influence on living things organism, especially that of human, are different. But, in total, they mostly influence by pollination during certain seasons and months of each year and affect the living things' immune system resulting in various allergies. Here we can refer to the allergic agent present in tomato, eggplant, cucumber and some melon-ground fruits such as oblong variety of melons, cantaloupe or deep-ribbed cantaloupe.

However, plant-borne agent having negative effect on living things can be dependent on the nature of the plant, itself, or any other factor affecting plants such as soil, weather, elevations and so on.

ROLE OF EARTH FORMING FACTORS IN MEDICAL GEOGRAPHY (MEDICAL GEOLOGY)

Mineral capabilities of Iran and accordingly, geological complicated mineral and industrial activities on one hand and development of urban planning and settlement regions and existence of diseases with an unknown cause, on the other hand, have necessitated the investigations on medical geology in Iran.

Suitable geological conditions are the requirements for the existence of living at any region of the Earth. Of initial important are oxygen, water and the environment in which the living things can live. These were obvious for human being from the earliest time of his life on Earth and therefore, human societies have been developed in regions with such conditions. But as time passed and as a result man's need to natural resources, he was further exposed to environmental factors. For the same reason, in historical references of many civilizations the relationship of environment and human health has been taken into consideration. But in some cases, the relationship with natural environment is also taken as an origin for health problems. For example, in a Chinese medical book dating back to two centuries B.C. there is a reference to the relationship between environment and health and moreover, the existence of some respiratory diseases caused by gravels, toxicity of lead in occupations and also, the poisoning characteristic of silver, copper, antimvan and mercury have been demonstrated (Curtis and Riva, 2010).

Currently with the available developed new sciences and making extensive investigations associated with environmental effects on human health, a relationship between geological conditions and health has been surprisingly indicated. In conclusion, in view of the scientific proof on the relationship of many diseases with geology, a new sub-discipline of science, namely Medical Geography has been founded. This new science is, in fact, involved in the examination of the relationship between geological factors, humans' and animals health as well as the influence of environmental effects on the geographical diffusion of related diseases (Ganji, 2001).

Poisoning elements present in soil and stone are formed by natural geochemical activities and human actions and they usually entered human body through eating and drinking and thereby, affect human health.

Since, drinking water is supplied in a natural manner and it is mainly affected by local conditions, the excess amount of some non-organic compounds entering human body through drinking water has caused problems in different areas (Kardavani, 2006).

An epidemic disease related with medical geography is Goiter (iodine deficiency) and other diseases associated with excess or lack of certain elements like fluorine and silicon. Cardiovascular diseases related with the physical hardness of water are subjects of medical geology in addition to other topics which will be discussed.

Medical geology, in general, is a science dealing with the examination of the relationship between geological factors and humans and animals health as well as the influence of environmental factors on the geographical diffusion of related diseases. In view of the scientific proof on the relationship of many diseases with geology, a new sub-discipline of science, namely Medical Geography has been founded (Ramesh and Hyma, 2005).

There are several factors in the structure which forms earth crust, i.e., reliefs, affected by earth internal layers as well as earth core and external factors including light, weather and climate and so on. As a result of the existing tectonic conditions and earth crust changes, the influence of geological factors and geographical diffusion on diseases and health in here and especially in Iran plateau, the 1996 Environmental Congress decided to organize an international working team in the field of medical geology aiming at the promoted importance of this subject among scientists, medical affairs specialists and the public (Smith, 2008).

And finally, since the environment can be regarded as the origin of reciprocal effects of geology and biology, there are many developing difficulties, challenges and environmental problems. Main and secondary elements of bed rock or earth may be turned to a direct treat for humans or animals health under certain conditions and to a fundamental cause of organisms' disorders and poisonings (Shokouhi, 2003).

In conclusion, medical geology, as a sub-discipline of medical geography provide an appropriate foundation to examine the influence of environmental factors that can reveal the role of other elements and factors in the establishment of human environments in a positive or negative manner and to identify the productive and/or destructive interactions in human decision making.

CONCLUSION

Obviously, it is necessary to consider the novel sub discipline of medical geography because it, as a base, may play a role as a determinant index in all principal and

fundamental aspects. Medical geography can secure all human and environment planned infrastructures.

And medical geography is the basic principal and observer in politic-economical, social and even cultural development of a system. However, medical geography can reveal rather more effective role in a more strict manner and novel characteristics through a series of guidelines, the most important of which are as follows:

- The underlying rule of any planning should be based on environment and human, i.e., it should have a fixed role in principles and structures
- An environmental identity book should be made for each geographical region containing all its features such as water, quality of soil, climatic structure, dispersion of planets and so on, enabling us to provide more time for the requirements in future planning, that is, each region should be codified to allow obtaining required sensitivities regarding environmental essence before any decision is made
- The major of medical geography with the branches of Human and Environment should be incorporated as a fundamental field of study in university system of education
- And at last, medical geography philosophically has a historical role and medically has a preventive role, respectively and every one, especially medical scientists, believes that prevention is predominant to treatment

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