

# **Medical Geology in India: As Depicted in Ancient Indian Literature**

**Author: Asmabanu S. Lohar**

(Junior Research Fellow, Department of History, Gujarat University, Ahmedabad)

**Email: [asmaslohar@gmail.com](mailto:asmaslohar@gmail.com)**

## **Abstract:**

The relationship between natural environment and human health has been known to man since ages. Geosphere as a part of natural environmental system along with other spheres have been influenced human and animal health by being parental body of aetiological factors as well as medicinal substances. Archaeological evidences suggest that geological materials as remedies to various diseases – both geogenic and non-geogenic have been used by various ancient civilizations since long. Like other contemporary civilizations a unique medical system too evolved in Indian subcontinent as is evident from its archaeological evidences and literary texts. Careful analysis of these texts like Vedas, Charak Samhita and Sushrut Samhita suggests that ancient Indians too like their other global contemporaries possessed the understanding of aetiological effects and remedial potential of geological substances and geological processes - the concept known as *Medical Geology* in modern terms. Present work will try to analyze some aspects of Medical Geology as depicted in ancient Indian texts like Vedas, Charak Samhita and Sushrut Samhita.

**Key words:** Medical Geology, Geogenic disease, Geomedicine, Rig Veda, Atharva Veda, Charak Samhita, Sushrut Samhita.

## **Introduction:**

Earth surface has provided men with various life sustaining and life supporting requirements including food, water and dwellings. As man started progressing by virtue of his industrious activities, he extensively used lithospheric resources. This bio - lithospheric relationship in turn impacted one of the most important aspects of human life i.e. health. Disease and medicine are the two strands of human health. Since ages both of these strands are greatly influenced by lithospheric conditions in which man has evolved. A new branch of study

known as *Medical Geology* emerged as a result of these age old relationship and its impact on human societies and state policies.

“Medical Geology is the science dealing with the relationship between natural geological factors and health in humans and animals and with understanding the influence of ordinary environmental factors on the geographical distribution of such health problems”<sup>1</sup> Though the idea that earth materials impact human health in direct way or otherwise are not altogether new, the more scientific and fundamental understanding of this re - emerging aspect of human health is new. Various national and international organizations have started working on this interdisciplinary aspect of human health in order to provide aetiological explanation and prevention strategies of numerous ailments by formulating state policies for the same. Inclusion of this geo - medical aspect in the curriculum of various academic institutions shows its importance and practical value.

Since ages India has developed its own potential and indigenous medical system. The Indus Valley Civilization which thrived around 3000 B.C. suggests through its building remains that the sense of sanitation and hygiene was prevailing among the inhabitants. As Deepak Kumar suggests these remains and the great bath in particular might be pointing towards the prevalence of hydrotherapy.<sup>2</sup> Archaeological remains at Indus Valley Civilization dating back to around 2500 B.C. suggest that the remedial quality of minerals were known to

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<sup>1</sup> Brian J. Alloway (ed.), *Essentials of Medical Geology : Impacts of Natural Environment on Public Health* (Amsterdam: Elsevier Academic Press, 2004), p.xi

<sup>2</sup> Deepak. Kumar, 'Medical Encounter Concepts and Practices in India: A Historical Outline', *Archives Internationales d'Histoire des Sciences* 55, no. 155 (2005): 357-366, pp.357

the inhabitants.<sup>3</sup> Rig Veda and Atharva Veda also contain verses related to various diseases and their medicinal treatments. Ayurveda, Siddha and Yunani medical systems have enriched it altogether with time. Medicinal texts of these systems have numerous references suggesting that our ancestors were acquainted with the concept of geological impact on health.

Scientific aspect of Bio-geospheric relations and their impact on human health as depicted in ancient Indian medical texts has been not comprehensively explored by researchers of this field. This paper will try to present some basic aspects of Medical Geology and will describe the developmental process of this re-emerging field by historical analysis of Indian medical texts.

### **Medical Geology: Meaning and aspects:**

The re - emerging and interdisciplinary field of Medical Geology studies impact of earth materials, earth processes and natural geological hazards on human health. Biogeochemistry, Geo-epidemiology and Geo-microbiology are some of the study areas that come under the purview of Medical geology. Fundamental blocks of earth surface are rocks and soil. Both of these are enriched with natural chemical elements. Proper anatomical and physiological balance of these elements in human body ensures human health. Elements in periodic table can be classified as major, minor and trace elements according to their requirement by human body and impact on human health. 4 Major elements are H (Hydrogen), C (Carbon), N (Nitrogen) and O (Oxygen). Sodium, magnesium, Calcium, Potassium, Phosphorus, Sulphur and Chlorine are 7 minor elements. Apart from these, 14 trace and 4 toxic elements are also regarded important from Medical Geological point of view.

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<sup>3</sup> Momin Ali, 'A brief history of Indian alchemy covering pre-vedic to vedic and ayurvedic period (Circa 400b.c. - 800 A.D.).' *Bulletin of Indian Institute of History of Medicine* 23 (1993): 151-166, pp.151

Some regions of earth surface are naturally rich in certain chemical elements while some are deficient on the basis of their geological formation process. This lack or extensiveness of medical geological elements affects humans and animals of that particular region through various pathways. Bio - geological pathways include natural earth processes as well as anthropogenic activities like mining, agriculture and building activities. Depending upon their quantity these elements either act as a medicine or as an aetiological factor in living organism.

As medical geology is concerned basically with human health, diseases resulting from geological influence are the most important aspect of it. Geogenic diseases can be classified into: Occupational diseases and non – occupational diseases. Occupational diseases have their origin from anthropogenic activities like mining, metallurgy, architectural activities and agriculture. Non – occupational diseases have water, food and air as aetiological factors.

Another important aspect of Medical Geology is geomedicines. The knowledge of medicines has played an important role in proliferation of human civilizations by contributing to the physical health of man.<sup>4</sup> Ancient civilizations along with other achievements in scientific field evolved their own medical system. Along with primitive surgical techniques, these systems included indigenous *Materia Medica* based on product of the three kingdoms – vegetable, animal, and mineral- according to the regional peculiarities of respective civilizations. Historical sources shows that mineral and metal medicines - also called geomedicines - derived from earth materials are having their hold on *Materia Medica* since ancient times. Paintings in Egyptian temples show that soils played an important role in

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<sup>4</sup> B. P. Radhakrishna, 'Medical Geology', *Journal of Geological Society of India*, 66 (October 2005): 395-400. pp.395

ancient Egyptian medicine.<sup>5</sup> With the progress in medical science in modern age, the hold of these earth materials on modern *Materia Medica* is intact as if showing their reliability.

Apart from disease and medicines some behavioural practices like geophagy form interesting facet of Medical Geology. The ancient practice of geophagy—deliberately eating soils—dates from prehistoric times across the globe. This soil eating behaviour helps in coping with mineral deficiency and serves therapeutic purpose. “However, ingestion of soil or clay brings with it the threat of pathogens, parasites, electrolyte imbalance, toxic trace-element exposure, if living close to mining sites (Plumlee and Morman, 2011); hyperkalemia (high potassium), intestinal blockage, abrasion of teeth, and other undesired consequences (Abrahams, 2005)”.<sup>6</sup>

## **Medical Geology as depicted in ancient Indian texts:**

### **1) Vedic literature and medical geology:**

Vedic age marked the beginning of historic age in India. The *Rigveda* may be assigned to c. 1500-1000 BC while *Atharva Veda* can be assigned to 1000-500 BC.<sup>7</sup> “It is impossible to find the right point of view for judging of Indian religion, morals, and literature without knowledge of the literary remains of the Vedic age”.<sup>8</sup> However Vedic literature apart from containing religious ideas also contains some information regarding medicines and medicinal ideas. Some of these ideas show that conceptual links between

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<sup>5</sup> EL-Ramady, Hasaan (ed), *The Soils of Egypt* (Cham: Springer, 2019), p.177

<sup>6</sup> Sayed, E. Hasan. 'Geology and Health : A Brief History from Pleistocene to Today.' *Geological Society of America Special Paper 501*, September 2013, pp. 3

<sup>7</sup> R.S. Sharma, *India's Ancient past* (New Delhi: Oxford University Press, 2006), p. 20

<sup>8</sup> Max Muller, *A history of ancient sanskrit literature* (Edinburgh: Williams and Norgate, 1859), p. 9

earth substances and health were known during these early centuries of pre-Christian era in India.

Personification of natural forces such as wind, water and earth is a common feature of Vedic hymns. Along with other natural forces like air, fire, and water earth is highly revered in *Atharva Veda*. 63 verses are devoted in the praise of mother earth in *Prithvi sukta*. It is attributed with the adjectives like keeper of creations, container of forest trees and herbs and the all supporting (*Vishvadhayasam*). Earth is praised as a source of food, proliferator of living organisms as well as source of precious substances like gold and Mani. Use of earth surface as a source of remedy is also attested to by the Vedic sages in *Atharva Veda*.

In Medical Geological studies source of exposure and pathway of geological materials to living organisms are two fundamental blocks. Air, water and food play a vital role as these blocks. This exposure – pathway concept is visible in Vedic texts to some extent. From medical geological point of view it is interesting to note that the Vedas not merely personify water and attribute divine remedial features to it but they do so along with mentioning certain geographical area within which that water flows and the disease which it cures. Apart from personification, medicinal properties have been attributed to water reflects a glimpse of medicinal knowledge of the Vedic sages. In one hymn of Rigveda the sage asks the water to bring to perfection all disease dispelling medicaments for his body.<sup>9</sup> It is well established by scientific research that water in its pure form contains no elements beside Oxygen and Hydrogen. Thus the disease dispelling property of water mentioned in Rigveda might be attributed to the presence of certain geological element in it.

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<sup>9</sup> Ravi Prakash Arya & K.L. Joshi (eds.), *Rigveda samhita* (Delhi: Parimal Publication, 2016), *mandala 1, sukta 23.21*

Thus in one hymn the sage asks the water that flows from *Himavant* Mountain and somewhere in the river *Sindhu* to treat his *hrddyota* (heart-burn).<sup>10</sup> Many other shlokas of Atharva Veda too describes water as having ambrosia (nectar) and disease curing properties in it including eye and feet diseases.

## **2) Some Glimpses of Geogenic diseases and Geomedicine – Charak samhita and Sushrut samhita:**

### **Importance of doze:**

Defining the doze is crucial when we talk about medical geology. Importance of doze was well emphasized by Paracelsus (1493-1541), a Swiss physician and alchemist when he said: “*All substances are poisons; there is none which is not a poison. The right dose differentiates the poison from a remedy.*”<sup>11</sup> Essential element too can be a disease causing factor if taken excessively. Both excessive amount as well as lack of geochemical element acts as an aetiological factor as is well evident from fluorine amount in water and its impact on teeth. This basic law of medical geology was mentioned by *Charaka*, an Indian physician of 1<sup>st</sup> century A.D. in his *Charak samhita*. He said “*There is no substance in universe which can't be used as drug on the condition that they are used rationally and with a definite objective*”.<sup>12</sup>

### **Geogenic diseases:**

Though Ayurveda is based on the theory of *vata*, *pitta* and *kapha* as far as aetiology is concerned, we find geo-aetiological factor in the form of geological substances in classical

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<sup>10</sup> K.L. Joshi (ed.), *Atharva Veda Samhita* (Delhi: Parimal Publication, 2015), *kanda 6, sukta 24, shloka 1*

<sup>11</sup> Bjeldanes Leonard & Shibamoto Takayuki, *Introduction to food toxicology* (Massachusetts: Academic Press, 1993), p.1

<sup>12</sup> Gabriel Van Loon (ed.), *Charaka Samhita*, volume1 ( Varanasi: Chaukhambha Orientalia Publishers, 2002), p.542

Ayurvedic texts. The clear pathway including source of exposure, assimilation by target organ and anatomical or physiological impact on that organ is crucial aspect of Medical Geology. Ancient Indian Ayurvedic texts like *Charaka Samhita* and *Sushruta Samhita* meet this vital aspect to certain extent.

Scientific researchers have proved that due to some geochemical and bio-geochemical mechanisms including mechanical and biochemical rock weathering water can be enriched by or lacking in various geochemical elements according to its source of origin and its course. Taking this fact into consideration some modern state policies for public health include manual addition of chemicals in drinking water to prevent geo-deficiency diseases. *Charaka* has mentioned this aspect when he says: “*The Rivers originating from Malaya, carrying stones and sand have clean water which is like nectar*” (*Charaka samhita, sutrasthana, chap 27, 209-212*) and again “*The Rivers originating from Pariyatra, Vindhya and Sahya cause head diseases, heart disease, leprosy and filaria*”.<sup>13</sup>

Connection between water of those rivers originating from certain mountains and various diseases like leprosy (*kushtha*), abdominal disease, goitre as well as piles and elephantiasis is also mentioned by *Sushruta* in *Sushruta Samhita*. Goitre is said to be an endemic by *Sushruta* amongst those who lived on the banks of rivers, originating from *Himalaya*.<sup>14</sup>

Atmosphere also plays an important role as a medium of exposure and pathway for geological elements. Mineral and metal particles present in air when inhaled by living organisms in certain extent causes geogenic ailments. Both *Charaka* and *Sushruta* have considered dust and silica- two geological substances as aetiological factors by. *Charaka*

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<sup>13</sup> Ibid, p. 267

<sup>14</sup> Dr. Anantram Sharma (tr. & ed.), *Sushrut Samhita*, volume 1 ( Varanasi: Chaukhambha Surbharti Prakashan, 2019), P.353

attributes dust as causative of head diseases (Charak samhita, sutra sthan, chap17.8 -17.10).<sup>15</sup>

While according to *Sushruta* exposure to silica is one of the causes of cough (Sushrut samhita, uttartantra, chap 52.4).<sup>16</sup>

Geophagy serves as a direct exposure source of geological materials to living organisms. Geophagy or deliberate earth – eating has been practised by humans, animals and birds from ages. This behaviour is connected with mineral deficiency and relief from hunger pangs by the experts. The historical understanding of **geophagy** and its impact on human health in India goes back atleast to the time of *Charaka*. *Charaka* has mentioned types of earth and anaemia caused by eating them. He says: “*In the person habitually eating earth on of the dosas get vitiated (according to the type of earth). Such as vata, pitta and kapha by astringent, alkaline and sweet earth respectively. The earth moreover produces roughness in dhatus. It fills ups and obstructs the channels without undergoing change and thus by destroying the strength of the sense, lustre, energy and ojas produces panduroga*”(Charaka samhita, chikitsasthan, chap16, 27-30).<sup>17</sup> Thus *Charaka*, a revered ancient Indian physician has not simply mentioned the disease i.e. Anaemia and its cause but also explains types of earths as aetiological factor and its impact on human physiology as well.

## Geomedicine:

Medicines prepared from minerals and metals have their hold on Materia Medica since ages. Both *Charaka Samhita* and *Sushruta Samhita* speak about *parthiva* medicines. Various metals, precious stones, pearls, metal ores and clay as well as earthen potsherds are considered as *parthiva* medicines. Though metals and minerals are praised by classical

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<sup>15</sup> Gabriel Van Loon, op.cit, p.671

<sup>16</sup> Dr. Anantram Sharma, op.cit, p. 432.

<sup>17</sup> Gabriel Van Loon, op.cit, p. 655

Ayurvedic authors, rational use of these substances is highly weighted upon by them.<sup>18</sup>

*Charaka* has mentioned various metals, salts and clay as ingredients of medicinal preparations (*rasayana*). Metals like gold, silver, copper and iron as well as black earth and corals formed basis of medicines prescribed by *Charaka* in various anatomical and physiological disorders.

*Sushrut samhita*, written by ancient Indian surgeon *Sushruta* is also a rich treasure as far as geomedicines are concerned. *Sushruta* has recommended various geological materials including metals like iron, copper, silver and gold as well as precious stones like ruby, shell and corals to treat various diseases including ophthalmic disorders, excessive thirst (*Trishna*) and anaemia (*panduroga*).

## Conclusion:

Thus the field of Medical Geology deals with broad and complex relationship of various spheres of earth system. This bio-geo-hydro-atmospheric field plays crucial role in understanding causes of and providing remedies for various diseases. Bacteria, virus and fungi are not the only aetiological factors. For better understanding of health impacting environmental factors and generating awareness for the same to prevent Geogenic diseases, the interdisciplinary field of Medical Geology is important. Careful analysis of ancient Indian medical text could provide better understanding of historical evolution of medical geological concept in India. Also some unknown aetiological factors and geo- medicinal substances might come to the surface. The nectar produced by such analysis can be a boon to whole mankind.

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<sup>18</sup> Shriram Savrikar Basavaiah and Ravishankar, 'Introduction to 'Rasashastra' - The Iatrochemistry of Ayurveda', *African Journal of traditional, complementary, and alternative medicines* 8 (July 2011): 66-82, pp.66

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