

AN OVERVIEW ON MEDICAL GEOGRAPHY IN ANCIENT WISDOM: A REVIEW OF AYURVEDIC CLASSICS

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Abstract : The health and well being of humankind are intimately tied to the quality of air, water and soil being influenced by the regional and local geography where a population resides. Human health and human civilization depend on flourishing natural systems and the wise stewardship of those natural systems. Geologic materials not only influence human health but also that of plants and animals and in a broader context of all the non living components as well. Despite of its critical role in human health and well being full significance of geography and other ecological factors in ecological health was not recognized until. Medical geography, an emerging branch of medical science deals with medical phenomena in relation to place and seeks to identify the particular assemblage of health and related phenomena. This awareness that disease may have a connection with the geographical environment may be traced back to an ancient period in human history. However ancient scholars and practitioners of medicine like *Acharya Charaka* and *Sushruta* & other were cognizant of this relationship. The importance to health of customs of diet, dress and types of settlement & housing and of physical environment factors such as climate, vegetation, altitude and topography have been also widely recognized since the time of Hippocrates. Medical geography which is gaining significance in contemporary medicine has its origin from Hippocrates. Geographical variation has been studied as geographic pathology, medical ecology, medical topography, geographical epidemiology, geomedicine and other rubrics. Study of geography has been emphasized in *Ayurvedic* classics under the umbrella term of '*Desha Pareekshya*' in reference to *Roga & Rogi Pareekshya*, *Dravya* or *Ousadha Pareekshya*, *Ahara Vidhi Viseshayatana*, *Janapada Dhawmsa*. Various Researches have been conducted on geographical impact of disease which seeks to determine how human health & well being, traditional diet & customs, spatial pattern of disease are influenced by geological factors. Geographical investigation of the spatial variation of disease provides important insights into what contributes to disease outcome and options for disease prevention Hence an attempt has been made by the author to explore the concept of '*Bhumi Pareekshya*' i.e. evaluation of geographical factors for understanding their impact on various diseases which may contribute for early recognition and prevention of prevalence of some endemic diseases

Index Terms - *Bhumi Desha*, *Atura Desha*, *Atura Pareekshya*, *Ousadha Pareekshya*, Medical Geography, Medical Ecology, Endemic diseases.

Introduction:

“If you want to learn about the health of a population, look at the air they breathe, the water they drink and the places they live”. This famous quote in the treatise of Hippocrates emphasizes the importance on the impact of air, water, place (Region) where the person lives. Influence of various environmental factors like air, water etc on human health & well being was quoted in the treatise of Hippocrates ^[1]. Later on Galena, a Greek physician, surgeon in Roman Empire reiterated this aspect and says that the physician must be acquainted with air, water, localities, occupation, food & drink, customs etc to discover the possible causes of all diseases. However *Charaka Samhita* the great compendia of *Cikitsa* which was written centuries before of Hippocrates also elaborately speaks about medical geography, Ecological medicine, clinical ecology etc under the broad umbrella term of '*Desha Pareekshya*' in reference to *Vyadhi & Atura Pareekshya*, *Dravya (Ahara & Ousadha) Pareekshya*, *Janapada dhawmsa* and adoptance of *Ahara Vidhi & Vihara* (Life style & conduct) accordingly ^[2].

Health and well being of humankind are intimately tied to the quality of air, water and soil of which are influenced by the regional and local geography where the population resides. Ecology and geographical factors under regional or local geography not only influence human health but also that of plants and animals and in a broader context of all the non living components of the environment as well. Human health and human civilization depend on flourishing natural systems and the wise stewardship of those natural systems. Medical ecology is still considered as an emergency hybrid science striving to supply the missing connection between health and ecological & geological factors enabling a more complete understanding of human health in the context of ecosystem service.

Aims & objective:

- 1) Exploration of the concept of '*Desha Pareekshya*' in Ayurvedic Classics and understanding its relevancy in various emerging field of contemporary sciences like Medical ecology, Medical geography, ethno botanical study etc.
- 2) Creating awareness about the unavoidable effect of various geological factors on health and disease as well as early recognition & prevention of common endemic diseases accordingly.

Review of literature:

Geography is basically the study of diverse environments, places and spaces of earth's surface and their interaction or concerned with question about places and their description. The modern academic discipline of geography is rooted in ancient practice concerned with characteristics of place in relation to their natural environments and people as well as the relation between two^[3]. Medical geography is a recent branch of geography which attempt to prove the environmental effects on the health of mankind with due consideration to local & regional variation of environmental condition. Medical geography deals with medical phenomena in relation to place and seeks to identify the particular assemblage of health and related phenomena. Most of the time the natural environment in which the person lives and settles becomes the major cause for a pattern of disease from which he suffers due to influence of geographical factors such as landforms, soil, climate, vegetation, flora & fauna and microorganisms. Environmental factors are undoubtedly casual factors affecting both human health and disease. Status of geographical and other environmental condition is often considered as status of the health of the community. Hence understanding the environmental aspects towards the health & well being as well as detect the spatial pattern of occurrence of disease with cause & effect relationship with space can be considered as vital concern. A research on the geography of disease seeks to determine how health is influenced by geographical factors. Geographical investigation of the spatial variation of disease provides important insights into what contributes to disease outcome and options for disease prevention. Sometimes disease occurs in some places and is missing in other places or rate varies from place to place. Important variation in access to health care and health outcomes are associated with geography giving rise to profound ethical concern. Some of the diseases are very common in certain specific region. Genetic condition, custom of food, life style belonging to certain specific region may put impact in occurrence of such specificity of diseases. The concept of medical geography has been referred as concept of '*Desha*' in Ayurvedic classics. According to *Acharya Charaka*, *Desha* is the habitat means geographic region where the individual belongs to and contextual analysis of *Desha* has been made in reference to *Atura Pareekshya* and *Ousadha Pareekshya*^[4]. *Desha* has been described in reference to *Bhumi Desha* and *Desha Desha*^[5]. Geography can be broadly divided into physical characteristics i.e. physical geography, impact of geography on human characteristics i.e. human geography and the interaction of geographical factors with environment i.e. environmental geography. There is vivid description of physical geography is found in different *Ayurvedic* classics. Various physical characteristics related to geography have been described under different type of *Bhumi Desha* like *Jangala Desha* (Arid), *Anupa Desha* (Marshy) and *Sadharan Desha* (Medium)^[6].

Physical geography or *Desha Lakshana*:

Arid zone is even like sky, has mostly sparse, few and thorny plants, scanty water of rains, stream and wells, hot and harsh winds, sparse and few mountains, inhabited by the people mostly of firm and lean physique and frequented by *Vata* & *Pitta* predominant diseases^[7]. According to *Acharya Charaka*, *Jangala* or arid type of country is characterized by scarcity of water and trees and plentifulness of air and sunshine. It causes

minimum number of diseases^[8]. *Anupa* or Marshy place is inaccessible due to abundance of water, ditches and mounds, rivers and rain, has soft and cold breeze, numerous big hills and trees, inhabited mostly by the people with soft, delicate and corpulent body and *Kapha-Vata* predominant diseases are mostly found^[9]. *Anupa* or marshy land is characterized by the abundance of water and trees and scarcity of air & sunshine. It causes many diseases^[10]. Medium place or *Sadharana Desha* is that which has the characters of both the above types. *Sama* or moderate type of country is characterized by moderation in the above mentioned factor. As the cold, heat, rains and wind are moderate in medium place equilibrium in the strategy of *Dosha* is mostly found^[11]. The climate system of the earth is complex. Different kinds of climate system are found in different geographical location. According to classification of Koppen five major type of zone are found based on physical and environmental geography in the world i.e. tropical, dry, temperate, continental & polar^[12]. Tropical zone is specified by hot & humid climate in summer and cold & moderate winter. Sub tropical zone has typically hot summers even hotter than tropical climate. Again tropical semi arid & arid and sub tropical semi arid & arid zone are found in various part of country. For ex western Rajasthan witnesses the sub tropical arid (desert) climate and North & North-East of India witnesses sub tropical humid climate. Sub tropical arid zones are mainly desert and sub tropical semi arid and Tropical dry zone represent the characteristics of *Jangala Desha* as per *Ayurvedic* perspective. Tropical marshy lands with hot & humid climate in summer and moderate winter represent *Anupa Desha* as per *Ayurvedic* perspective. Various geographical factors like soil, vegetation, climatic condition influence the food habit, customs, life style, strength, mental condition, wholesome & unwholesomeness of specific diet or habit in particular geographical region and in predominance of bodily humor (*Dosha*) or triggering some specific disease. Hence evaluation of impact of geographical factors as well as food habit, custom or wholesome & unwholesome effect of dietary regimen in specific region in triggering the etiopathogenesis of some disease or ascertain the therapeutic has been advocated in *Ayurvedic* classics. It has been broadly emphasized in the compendia of *Charaka Samhita Vimana Sthana* that nature of land should be examined with a view to ascertain the specific features of individual patients on the basis of place of birth and place of affliction & growth of the particular disease in purview of inclination to specific food habit, life style or conduct, customs, natural strength, *Dosha* Predominancy etc^[13]. Not only for understanding the evolution of disease and advice of proper therapeutic regimen but also for prevention of prevalence of endemic diseases and restoration of health of individuals under particular geographical region, the role '*Bhumi* or *Desha Pareekshya*' has been emphasized in great compendia of *Acharya Charaka*.

***Bhumi Pareekshya* in reference to Medical Geography & Medical Ecology for *Atura Parijnana*:**

Regional effect for prevalence of some disease in particular country it is evident that the geographic distribution of disease is neither random nor uniform. Rather diseases vary spatially. Diseases that are always present endemic in certain location are often completely missing in others. For ex it has been reported that Crohn's disease is more common in northern climate^[14]. Though Malaria has been considered as global threat but largest extend of Malaria & Schistosomiasis are more commonly seen in Africa. Japanese Encephalitis is common in south, south east and East Asia closely linked to irrigated rice production occurs as endemic outbreak with high mortality rates among children^[15]. Similarly diseases of the tropics and subtropics have been known since ancient times. Ebola and Marburg viruses have focal distribution and cause dramatic human outbreaks with high mortality.

Regarding consideration of birth place for evolution of some diseases, an epidemiological survey has been conducted to understand the association between birth place and current asthma and as per the report has been published in American journal of public health it was evident that Asthma is a disease of complex traits, with interactions between multiple genetic and environmental factors^[16]. Place of birth has often been associated with Asthma. Studies on immigrants have shed light on the role of environmental and acculturation factors in the development and exacerbation of Asthma. Asthma prevalence is higher in westernized in economically developed countries than developing countries. This global variation can be explained to some extent by differential level of exposure to environmental risk factors.

In reference to evaluation of various geological factors like water soil, trace elements or minerals or presence of specific bacteria in soil of particular region for the onset of disease, it needs to identify geochemical anomalies in soils, sediments and water that may impact on health. For ex trace elements play essential roles in the normal metabolism and physiological function of animals and human. The source of

trace elements is varied in soil and water. Source of trace elements from food derived from soil and water in a particular region results various diseases either due to its deficiency or excess quantity. Like Selenium is an essential trace element having anti oxidant, protective function as well as thyroid hormone regulation properties. However Selenium deficiency (due to soil low in Selenium) has been shown to cause severe physiological impairment & organ damage such as juvenile cardiomyopathy and muscular abnormalities^[17]. The disease was always located in areas with low Selenium soil. Similarly Fluoride, the ionic form of Fluorine can stimulate bone formation. But excess fluoride exposure can cause Fluorosis of the enamel (mottling of the teeth) and bone (Skeletal Fluorosis)^[18]. One organism *Coccidioides Immitis* thrives in surface soil in arid and semi arid areas with alkaline soil, hot & short summer, moist winter and results Coccidioidomycosis which is endemic in south western USA, Mexico and central & South America.

Evaluation of geographic region as well as multiple geographical factors can be considered as vital concern as one of the important health determinants for the evolution & triggering the disease. For ex natural occurring dust due to local conditions such as the dusts generated by mining hard rock's of coal, use of fine grained mineral matter in sand blasting results respiratory problems, cough, fever including damage of internal organs. Similarly water, sanitation, food and air quality are the vital elements in the transmission of communicable diseases in a particular region and the spread of diseases prone to cause epidemics. Exposure to extreme low temperature in cold climate can worsen one's existing medical condition especially in older people and people with respiratory problems.

Impact of Geography on dietary or food habit:

Throughout the human history dietary factor has been considered as one of the important factors inducing and causing outbreak of some diseases. Geography doesn't just determine whether humans can live in a certain area or not, it also determines people's life style as they adapt to the available food and climatic pattern. Geographical location is also a key element that influences food habits and cultures. As humans have migrated across the planet, they have to adapt to all the changing conditions they were exposed to. Hence understanding the diet, dietary habit and custom of people exposed in a particular geographical condition and its impact on health & disease evolution can be emerged as matter of research in relation to geography. For ex individuals who live near the sea they often addicted to more sea food. In east India cuisine, the staple grain happens to be rice. The eastern belt is majorly a rice producing region. Hence rice is popular in west Bengal and Odisha [19]. Different dietary habit and food consumption have their own geographical distribution. Efficacy of diet & drug when indulged in long run or in maximum dose or opposite to the physical characteristics of geography it produces incompatibility. Hence dose & duration of dietary intake must be advised with due consideration to the attributes of diet and attribute of climatic & environmental factors to prevent the incompatibility. Hence among eighteen factors to develop incompatibility the impact of particular region or location has been advised under the heading '*Desha Viruddha*'. For ex intake of *Ruksha* (Dry) and *Tikshna* (sharp) substances in desert and *Snigdha* (unctuous) and *Sita* (cold) substances in marshy land in regular habit or as main diet in regular diet develops incompatibility & trigger some diseases^[20]. Similarly nature of locality can be considered as one of the vital concern to aggravate the unwholesome effect of some food. For ex *Vrihi* type of corn is unwholesome as it aggravates Pitta. However it produces more unwholesome effect if taken in a marshy land^[21]. Among *Asta Aharavidhi Viseshayatana*, it has been advised to consider the impact of *Desha* or locality to determine the utility or non utility of particular dietary regimen. Hence one can get acclimatized to different type of localities by using dietary regimen having opposite qualities. Food desert are region where people have limited access to healthful and affordable food. This may be due to having low income or having to travel far from their to find healthful food options. Without access to healthful food people living in food deserts may at higher risk of diet related conditions such as obesity, diabetes & CVD. Unhealthy eating behavior like eating raw/undercooked food or meat and products from wild animals are not abandoned, food born infectious diseases will remain an important risk factor of outbreaks and epidemics. Current understanding of foods or dietary patterns and risk of major chronic disease which might contribute to the role of popular diet concept in various zones. Each zone has its own set of standardized eating etiquette in its long term practice. Reasonable eating behavior can provide adequate and balanced nutrition to our body where as unhealthy eating behavior is closely related to occurrence of diseases not only chronic non communicable diseases but also infectious diseases. A number of studies have shown that unhealthy eating behavior has a certain impact on the occurrence and development of infectious diseases. For ex in Japan, where seafood resources are abundant and raw food culture is popular more than 70% of food borne illness have been

linked to seafood. Clonorchiasis also known as liver fluke disease is endemic in China, Korea, and Japan [22]. It was one of the most serious food born parasitic diseases in China at the beginning of the twenty-first century. Similarly people of Bahlika, Saurashtra, Sindh and Sauvira are mostly languid and have loose flesh and blood as they are inhabited with excess salt in regular diet [23]. Blindness, impotency, baldness, grey hair and heart diseases are more prevalent in Eastern side and China due to excess alkali [24].

Food is not just a physiological need but as a social necessity and a symbol of subjective belongings, customs and tradition. Traditional and local foods are part of the cultural cuisine which have a discrete cultural identity and were common in societies before modernization and industrialization. Traditional and local foods by definition include all foods that have been prepared using local natural resources and have cultural acceptance. It also comprises the accessibility, the ways for preparing and consuming and their nutritional implication. Traditional food is defined as products that are frequently consumed or associated with celebrations and special occasions such as festivals. Local food items specific to a region or country. Dietary fats are made up of different fatty acids depending on the food source. A growing proportion of fats are acquired from animal products which tend to be particularly high in saturated fats. Saturated fatty acid are often found in animal fats and eaten in high quantities can raise cholesterol levels. Approximately one billion people worldwide rely on fish as their main source of animal protein. Consumption of fish is usually higher in areas that are near the coast where alternative protein source are lacking. Changes in diets are needed to cope with the burgeoning epidemic of chronic diseases. Whereas mono saturated and poly unsaturated fatty acids are found in nuts, seafood and certain vegetable oil and can lower cholesterol levels. Poor nutrition results obesity, high blood pressure, osteoporosis.

Indian cuisine consists of variety regional and traditional cuisines native to the Indian subcontinent. Given the diversity in soil, climate, culture, ethnic groups, geographical location (proximity to sea, desert or mountains) and occupation, these cuisines vary substantially and use locally available spices, herbs, vegetables and fruits. The food of Andhra Pradesh is known as for its heavy use of spices and the use of tamarind. Dahi (Yogurt) is a common addition to meals as a way of tempering spiciness. The quality and mineral contents of the soil in a given region can affect local food habits by making certain crops more or less successful, depending on the crop's need. Climate affects local food habits by determining how long a growing season is and how many growing seasons there are per year.

In India entire population prone to IDD due to deficiency of Iodine in soil of the subcontinent and consequently the food derived from it [25]. To combat the risk of IDD, salt is fortified with iodine. Goiter and cretinism are due to iodine deficiency in crops grown on iodine deficient soil with consequently low iodine in the diet for live stock and humans. Iodine deficiency leads to a much wider spectrum of disorders commencing with the intrauterine life and extending through childhood into adult life with serious health problems like goiter, cretinism, abortion, mental retardation, etc.

Association of geographic region with mental health:

Concept of Geographical psychology which is a recent emerging branch to highlight the influence of geographical perspective in understanding how psychological process interacts with macro environmental characteristics has its evolution since ancient time. Acharya Charaka in his Compendia highlighted on evaluation of geographical impact on mental strategy to ascertain the specific feature of disease in reference to *Atura Pareekshya* [26]. As per the research conducted the cause and the processes by which psychological characteristics become spatially clustered have been explained in terms of three main mechanisms like selective migration, ecological influence and social influence. Selective migration mechanisms look at how individual psychological characteristics influence the environment people select. Ecological and social influence looks at how external forces affect psychological process and developments. Geographical psychology examines links between location and psychological phenomena, such as how and why personality traits, life satisfaction and social behavior differ from place to place or clusters in certain areas. Researchers have long explored the links between geography and mental health, hoping to answer questions such as whether the environment in which we live affects our personalities. Research suggests that people who live in regions with more comfortable temperature tend to rate higher on the personality traits of agreeableness, conscientiousness, emotional stability, extraversion and openness to experience than people from less comfortable regions. There is geographical variation in the ways in which people think, feel and behave. Geographical psychology is an emerging subarea of research concerned with the spatial

organization of psychological phenomena and how individual characteristics, social entities and physical features of the environment contribute to their organization. Studies at multiple levels of analysis have indicated that social influence, ecological influence and selective migration are key mechanisms that contribute to the spatial clustering of psychological characteristics.

Satmya is anything that offers a wholesome effect or comfort to a person. This is especially true for many cultural foods and practices found throughout the world. *Desha Satmya* refers to the suitability and adaptation in a particular geographical area. The food items growing in a region inherently has some specific properties. For example those growing in arid zone are light to digest and those in marshy areas are heavy to digest. Having a diet and life style with the opposite qualities of the geographical region has a balancing effect on the people living in that area ^[27].

***Bhumi Pareekshya* for evaluation of immune response:**

Concept of Ecoimmunology is a rapidly expanding field that aims to investigate the causes and consequences of variation in immunity within an ecological and evolutionary framework has its origin in ancient science. Evaluation of '*Bala Pareekshya*' as per geographical location has been advocated by *Acharya Charaka* in reference to *Atura Pareekshya*. It explores how the environment shapes immune function which in turn influences host-parasitic relationships and disease outcome. Importantly immune function can be suppressed, depressed, reconfigured or stimulated by exposure to rapidly changing environmental drivers like temperature, pollutants and food availability.

***Bhumi Pareekshya* for Ousadha Parijnana:**

It has been emphasized in Ayurvedic classics that nature of land should be examined with a view to ascertain the specific features of medicinal plants in different localities ^[28]. Because the dominance of some plant species could be due to the similar geographical and climatic conditions. Hence the diversity of medicinal plants species used and the associated indigenous knowledge are of great value to the local community and their conservation & preservation is paramount. The therapeutic uses of the documented plants provided basic data for further research focused on pharmacological studies and conservation of the most important species. Since the acceptance and use of herbal medicine is increasing globally, ethno botanical survey focus on the complex connection between local inhabitants and local plants including practices and cultural beliefs. A primitive people lived well or ill according to the wealth or paucity of useful species of plants at their disposal. Primitive tribes depend immediately upon their floral environment. Under such condition intimate dependence upon the vegetation of their habitat, a people would naturally be induced to become acquainted with all the plants which grew around them. Again high concentration of phytochemicals as well as highest biological activities varies with variation of geological factors. Geosphere and biosphere co evolved and influenced with earth's biological and mineralogical diversity. Hence quantity & quality of phytochemicals constituents varied significantly across the population collected from different altitude. The biosynthesis of the secondary metabolites of the plants is determined by genetic and environmental factors as well as their interaction. A variety of environmental factors such as season, altitude and soil nutrition etc significantly modify the secondary metabolite profile in plants. The analysis of the phytochemical content of plants as per geographical location at varying altitude can help to select elite genotype and reflect the best suited altitude for commercial cultivation of species as these phytochemicals are considered as the basis for their medicinal activity ^[29].

Discussion:

For identification of the epidemiologic characters of disease and their corresponding influential factors at the regional level, geographic information system is one of the most powerful tool. Ecological medicine addresses the interactions between the individual and the geographical factors like environment, soil, climate etc and their health consequences accordingly. In contemporary science Health ecology is an emerging field of study researching how changes in the earth's ecosystem affect human health. Because human health ultimately depends upon ecosystem products and services such as availability of fresh water, food and other resources which are requisite for good human health and productive livelihoods. The disease ecology framework also provides an explanation for the uneven geographic distribution of diseases and to develop new approaches to surveillance and monitoring the geographic distribution of disease with early

recognition accordingly. Hence it needs to develop an understanding the relationship between disease and environment by correlating the relationship among pathogens, hosts or receptors and the environment. It may prevent the infectivity and virulent of organisms that threatens human health at population level in a specific region. Caring for patients in today's world requires an understanding of the basic factors that underlie the geography of human disease and events that cause shifts in the distribution and burden of specific disease. Why are some infectious disease found only on focal geographic region or in isolated population or why does the impact from widely distributed infections vary markedly from one region or population to another.

Conclusion:

The concept of '*Bhumi Pareekshya*' in reference to understand the impact of geography towards specific nature of disease which has been emphasized since from ancient times views health from a holistic perspective encompassing society and space and it conceptualizes the role of place, location and geography in health, well being and disease. Where we are born, live, study and work directly influences our health experiences. Hence it need to access the air we breathe, the food we eat, the water we drink, the viruses we are exposed in a geographical region where we live for early recognition of common endemic diseases as well as for advice of dietary regimen & conduct accordingly. Global health issues can be reduced as well as prevented to some extent by recognition of geological factors and its impact on health, well being & prevalence of some endemic diseases. Hence association of geographical impact on health of individual, community even if of nation can be taken into consideration for global wellness.

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REFERENCES

- 1) <https://www.researchgate.net> Michael leveret Dorn, Medical Geography in Historical Perspective, Bulletin of the History of Medicine 76(3):617-619, January 2002.
- 2) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 2, Viman Sthana, Chp 8, Verse no 93, Chawkhamba Sanskrit Series Office, Varanasi.
- 3) <https://www.ncbi.nlm.nih.gov>
- 4) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 2, Viman Sthana, Chp 8, Verse no 93, Chawkhamba Sanskrit Series Office, Varanasi.
- 5) Tripathi Brahmananda, Astanga Hridaya of Vagbhatta, Sutra Sthana, Chp 1, Verse no 23, Chaukhamba Sanskrit Pratisthana, Delhi.
- 6) Sharma P.V, Sushruta Samhita Text with English Translation, Vol 1, sutra Sthana, Chp 35, Verse no 42, Chaukhamba Visvabharati, Varanasi.
- 7) Sharma P.V, Sushruta Samhita Text with English Translation, Vol 1, sutra Sthana, Chp 35, Verse no 42, Chaukhamba Visvabharati, Varanasi.
- 8) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 2, Viman Sthana, Chp 3, Verse no 47, Chawkhamba Sanskrit Series Office, Varanasi.
- 9) Sharma P.V, Sushruta Samhita Text with English Translation, Vol 1, sutra Sthana, Chp 35, Verse no 42, Chaukhamba Visvabharati, Varanasi.
- 10) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 2, Viman Sthana, Chp 3, Verse no 47, Chawkhamba Sanskrit Series Office, Varanasi.
- 11) Sharma P.V, Sushruta Samhita Text with English Translation, Vol 1, sutra Sthana, Chp 35, Verse no 43, Chaukhamba Visvabharati, Varanasi.
- 12) <https://www.nationalgeographic.org>
- 13) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 2, Viman Sthana, Chp 8, Verse no 93, Chawkhamba Sanskrit Series Office, Varanasi.
- 14) <https://www.ncbi.nlm.nih.gov>

- 15) <https://www.ncbi.nlm.nih.gov> Geography of infectious diseases.
- 16) Iqbal Shahed, Oraka Emeka, Association Between Birthplace and current Asthma: The Role of Environment and Acculturation, American Journal of Public Health.
- 17) <https://www.sciencedirect.com>
- 18) ESAkpata, IS Danfillo, Geographical mapping of fluoride levels in drinking water sources in Nigeria, African Health Sciences.
- 19) <https://www.researchgate.net/traditional> foods of India.
- 20) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 1, Sutra Sthana, Chp 26, Verse no 83, Chawkhamba Sanskrit Series Office, Varanasi
- 21) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 1, Sutra Sthana, Chp 28, Verse no 7, Chawkhamba Sanskrit Series Office, Varanasi
- 22) <https://pubmed.ncbi.nlm.nih.gov> Clonorchiasis: a key food born zoonosis in China.
- 23) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 2, Viman Sthana, Chp 1, Verse no 18, Chawkhamba Sanskrit Series Office, Varanasi.
- 24) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 2, Viman Sthana, Chp 1, Verse no 16, Chawkhamba Sanskrit Series Office, Varanasi.
- 25) Wang Xiaofeng Wang, geographical influence on thyroid abnormalities in adult population from iodine-replete regions: a cross-sectional study.
- 26) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 2, Viman Sthana, Chp 8, Verse no 93, Chawkhamba Sanskrit Series Office, Varanasi
- 27) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 2, Viman Sthana, Chp 1, Verse no 21.5, Chawkhamba Sanskrit Series Office, Varanasi.
- 28) Sharma R.K, Dash Bhagwan, Agnivesha's Charaka Samhita, Vol 2, Viman Sthana, Chp 8, Verse no 93, Chawkhamba Sanskrit Series Office, Varanasi.
- 29) <https://www.researchgate.net> Ethno botanical studies in India.

