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Conceptualising Medical Geography

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Abstract

As a sub-discipline of geography Medical geography studies the relationship between environment and health, life style and health, inequalities in distribution of health infrastructure. Medical geographers vow towards answering the questions pertaining to who gets what, where and why with respect to illness and appropriate care. This endeavor to answer such simultaneous questions is said to be started in 400 B.C. by Hippocrates. Medical geography consists of two major distinctive elements i.e. geography of disease and geography of health care; while both the aspects include health related discussion from spatial point of view, they have certain nuanced differences to account for. In recent times with the augment of ICT the sub-discipline has gained from sophisticated mapping technologies and statistical packages (including spatial statistics). The quality of the maps, as a cartographic product, has increased manifold, thereby reinforcing the notion that 'if it can't be mapped, it is not geography'. However, the main objective of this paper is to revisit the domain of medical geography from its origin to the present.

Keywords: *Medical geography, Medical cartography, Space, GIS, Disease.*

Introduction

One of the important discussing matters of medical geography is 'the critical evaluation of environmental and social determinants of disease and health' including the spatial aspect and mapping of health issues. Medical geography has evolved as a sub-discipline of geography that studies the relationship between environment and health, life style and health, inequalities in distribution of health infrastructure, and its associated issues from a spatio-temporal perspective. Jacques May has succinctly paraphrased the sub discipline in his words- 'Today we recognize that disease is a multiple phenomenon which occurs only if various factors coincide in time and space. The focus of interest widens to encompass the relationship between various factors of this complex and their respective geographical environments. This can be called "medical geography". To paraphrase, Medical geography is a promising field of research to analyse the geographical pattern of health and disease including its environmental and social relationship. Besides, it also depicts the location of health services and geographic factors affecting access and utilization with the help of spatial methods. Some ideas about medical geography from various points of view have been given below (Table 1):

Table 1: Multiplicity of the Medical Geography idea

Contributors	Ideas
De Vise, 1973	Medical geographers try to find out some answer like who gets what, where and why with respect of illness and appropriate care.
McGlashan, 1972	"Medical geography is a tool and but rarely an end itself. It is the application of geographical methods and skills to medical problems. One may consider geographical evidence on medical hypotheses".
Gesler, 1991	In Medical geography '… where a hospital lies within a spatial distribution is given more importance than what goes on within that particular hospital'.
Rosenberg and Wilson, 2005	Medical geographical research has focused on spatial analysis and place-specific examinations of the geographic distribution of medical care facilities, professionals, access and utilization to medical care services to identify under and over served areas.
Cromley, 2011	'Medical geographic research is grounded in place'.

Medical geography is becoming popular among social scientists like medical sociologists, cultural anthropologist, social psychologist, among others (Table 2, adapted from Meade, et al. who have relied heavily upon principles of spatial analysis.

Table 2: Social sciences' contribution to Medical Geography

Discipline	Contribution
History	Evolution of the major medical systems, changes in illness prevalence and treatment modes, awareness of historical inertia.
Political science	Impact of type of medical system, role of public and private power-wielding groups.
Economics	Medical costs and cost-benefit analysis, private and public payment plans, health care and economic development.
Anthropology/ sociology	Beliefs about illness causes and effective treatments, characteristics of patients and practitioners, patient-practitioners relationships.

Understanding Medical geography:

The term 'medical geography' was first used by a physician named Leonhard Ludwig Finke in the late 18th century, though the genesis of the idea is traced to the time of Hippocrates. In his famous book 'Air, water and places' he studied the relationship between health and environment in 400 B.C. As per August Hirsch, Hippocrates' work remained the only attempt which initiated philosophical treatment of geographical facts. Besides, the usage of the term 'medical geography' to describe the spatial distribution of disease is found in Leonhard Ludwig Finke's 'Versuch einer allegemeinen medicinish-praktischen Geographie' published in 1792. He made an attempt to describe a broad topography of disease. And also argued for a relationship between diseases and potential treatments

as outcomes of local environmental factors affecting specific populations. With the concretization of the sub-discipline, medical geography is made to answer following major six questions:

1. Why is a phenomenon distributed in a particular way?
2. Why are facilities and businesses located where they are? Why are the offices of physicians, public clinics, or research hospitals located in certain places and not in others?
3. Why do people move in certain directions for certain distances?
4. Why do innovations (including ideas and material goods) spread as they do?
5. Why do people vary in perception of the environment?
6. How do objects, ideas, processes, and living beings interact to characterize and constitute places?

Medical geography is essentially bifurcated into Geography of disease and the Geography of health care. Geography of disease or ill health describes disease frequency, illness occurrence, relationship between illness and associated environmental factors in respect of answering the three major questions of geography i.e. who, why and where. Whereas, the Geography of health care describes the facility location, accessibility and utilization, patient behavior patterns from the spatial vantage point. Parr classified medical geographical research into two dimension: research work on the spatial distribution of disease and death and geographical complexities surrounding the provision, access to and (in) equality of health care. Mishra further expands the idea include four perspectives of viewing Medical geography. First, it focuses on pattern of health and ill-health on space. Second, it studies the intensity and frequency of the health problem and various natural and socio-economic factors that determine the health condition. Third, it identifies causes and risk factors of health and ill-health by etiological hypotheses testing. And fourth, medical geography examines the spatial distribution of health care facilities with a view of suggesting policies, programmes and methodologies for locating them optimally and in conformity with the current and future needs.

In the colonial era when Europeans discovered many new lands, the rapid growth of medical geography took place. Because various diseases like plague, cholera, smallpox, tuberculosis, sexually transmitted diseases travelled from one place to another and thus the globalization of diseases took place. However, the growth of research studies in medical geography lost its pace due to the path breaking and historic feat of inventing the germ theory by Louis Pasteur in 1861. The theory gave importance on identifying the responsible germ of a disease and accordingly administers medicines that killed them. The study of Michael A Osborne on medical geography supported that the fact that germ theory of disease was 'the major reason for the decline of medical geographical activity'. But the germ theory was criticized for simplifying the complex were factors that caused diseases. Numbers of persons inhabiting a same region are not equally influenced by the germ due to differences in cultural practices, level of nutrition and individual attitudes. Hence, it may be concluded that only identification of germ as per the biomedical disease model, is not enough to

prevent diseases rather researchers should pay more attention to evaluating the socio-ecological model which identifies the impact of different geographical factors namely physical and socio-cultural factors on health. The socio-ecological perspective believes in advanced identification and prevention of diseases rather than its treatment. Social inequalities play a vital role in determining the health condition of human populations as the most influential 'determinants of health' are rooted in social structure. There are several works which describe the relation between geographical environment and health. To depict the relationship between environment and health Light has very significantly quoted Finke- 'To which diseases and evils is man exposed, because he lives here and not somewhere else, because he breathes this and no other air, he eats this and no other food, drinks this and no other water, has this and no other way of living and so on'. May also emphasized on geographical environmental factors to describe disease ecology: "…from the water the people get their food, also their cholera, their dysenteries, their typhoid fevers, their malaria; from the earth they get their hookworm; from the crowded village they get their tuberculosis and their yaws; from the type of housing they have been forced to adopt they get their plague and typhus; and from the food which earth, temperature, and rain produce, their protein deficiencies, their beri beri". Daniel Drake identified the geological, meteorological and social determinants of disease including diet, drink and dress in great inter mountainous region between the Rockies and the Alleghenies. With the help of epidemiological data Drake and Numbers found the geographical limits of malaria, typhus and yellow fever of this region. August Hirsch devoted himself to describe the geographical distribution of diseases and the identification of the most important factors (specifically race, climate, soil etc.) of disease occurrence from historical point of view. Warner contributed an important study based on America about the impact of environment on health. According to him 'the notion that the physical and social environments were significant factors in determining appropriate therapeutic behavior made region a necessary consideration in planning a patient's treatment and in evaluating the applicability of knowledge from another place'. Besides availability and accessibility of health care facilities various socio-economic factors like income, household wealth, education, and living style are strong factors of healthy well-being.

Medical cartography has contributed substantially in the development of medical geography being fuelled heavily by an underlying belief of the discipline that if it can't be mapped, it is not geography. Disease distribution and diffusion mapping is one of the important contents of medical geography forever. Adding to it, Learmonth argued that cartographic map interpretation may differ from a small to a large scale map. Various statistical techniques are used in geography like in other disciplines, but preparation of maps is a distinctive tool for analysis of geographical phenomena. Apparently the first such map was produced by Dr. Valentine Seaman in his treatise on yellow fever in New York City in 1798. For the first time maps related to health issue were included in an atlas by Heinrich Berghaus in his 'Physikalischer atlas' in

1852 to show the distribution of a variety of epidemic and endemic diseases. Another such work was done by John Snow in 1854 which is considered as the pioneer work depicted relationship between place and disease. He prepared a map and found water pump responsible for the cholera epidemic in the Golden Square district of London. Based on the findings Snow concluded that cholera as water borne disease, long before the invention of bacteriology . American Geographical Society published the 'Atlas of Diseases' in three volumes under the able guidance of Dr. Jacques May in the year 1958 and 1961. The Royal Geographical Society of U.K. published the 'National Atlas of Disease Mortality' in 1963 under the editorship of G. Melvin Howe .

Recent medical geography research studies are being done on utilization pattern of health care facilities, facility allocation model development in different geographical scale. By providing number of references Curtis and Taket supported medical geographers interest, "to interrogate health care in terms of (principally) modeling, access, inequalities (international, national, regional, local) and political and organizational reform, employing notions of social justice as well as critical evaluations of health-care reorganization such as deinstitutionalization". Mayer emphatically mentioned in his paper that 'geographical concern with the provision of health services and medical care developed historically after the ecological approach to studying disease patterns'. Many studies believe that only discussing about disease causation or disease etiology is not sufficient without knowing accessibility and utilization pattern of that area. Issues related to health care facility as well as facility allocation model should be developed by considering spatial aspect because health care utilization pattern, perception towards health facilities may differ from place to place .

Application of spatial statistical techniques and models play an important role to study health related issues. Spatially explicit modeling was used to delineate malaria prone area in eastern Africa. Relative risk mapping and scan test statistics were applied to find out the incidence variation of Notifiable Gastrointestinal Illness (NGI) in north-west territories of Canada from the spatial and temporal perspectives. Many of researchers found Bayesian spatial model as useful technique for the preparation of disease maps and to study health-environmental association. Hampton et al. found Uniform Model Extension of Bayesian Maximum Entropy (UMBME) and ordinary kriging methods as important geospatial techniques to analyze spatial variability of disease.

Medical geography was benefitted from the sophisticated computing trends during 1960's which percolated a bit late in India. Invention of computer, various modern instrument and software especially Remote Sensing, Geographical Information System (GIS), Global Positioning System (GPS), and different statistical packages have reinvigorated the sub-discipline altogether Armstrong has also considered the use of computer technology for the preparation of data for mapping as a promising development for medical geography. GIS techniques adorn an important place with regard to its capability to plan for future medical service provision and allocation of facilities in different locations. Applications of GIS

techniques are also being done by many of research institutions and Universities for gauging health related issues from a geographical perspective. As an example Center for Geographic Analysis (CGA) provides support for geographic analysis in public health research that relying intensely on geographical information system. CGA with collaboration of Harvard Map Collection (HMC) and Harvard Geospatial Library (HGL) provides 4,00000 maps, more than 6,000 atlases 1000 of reference books, 6,000 digital data layers .

Summing up

This paper argues that medical geography is a promising field of geography. It is a 'borderline discipline' which depicts all health related issues from a spatial aspect which is the core area of geographical enquiry. The conventional approach of medical geography is to analyze spatial patterning and location of diseases, illness and medical care facilities while recent research in geography of health and health care "embraces approaches which can be linked to the 'new cultural geography' and critical theories of the state in linking health and place". Both the approaches complement each other by emphasizing on understanding how and why diseases and health facilities spread over time and space. Spatio-temporal analysis helps to delineate different disease prone area, area having lack of appropriate health care facilities. It is easy to get more information about the etiology of particular disease by applying geographical techniques. Jones and Moon have used the term 'the local' to describe the important role of locality (geographical space) for the development of health planning strategy. They also recommended on including spatiality and temporality as important pillars in studying medical geography because 'people make a difference and places make a difference'. Duncan et al. also stressed on including the concept of locality and place in medical geography. Gesler suggested that medical geographer should pay attention to understand how the 'healing process works itself out in places (or situations, locales, settings and milieus)'. Concern about the relative importance of context (place) and composition (people) to find out health inequalities is a major research area of medical geography. Medical geography has appeared as 'new geography of health' with the emerging importance of place in the study of health issues because 'place matters with regard to health, health care and health policy'. The discussion of health related issues in Medical geography may be useful to health planner, doctors, and health policy makers. By considering spatial aspect geographers can easily delineate various disease prone areas, region having lack of health facilities which help to built facility allocation model or to prevent the occurrence and prevalence of diseases. It may be concluded that at present Medical geography is a very relevant thrust area of geography and has a broader scope in future.

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