Research Guru
Online Journal of Multidisciplinary Subjects (ISSN : 2349-266X)
UGC Approved Journal No. 63726
Impact Factor:3.021 website: www.researchguru.net
Volume-12, Issue-2, September-2018

GIS Application in Deficiency Disease Analysis from Doi's Combinations Method

Dayalan N
Guest Lecture, Department of Geography, Periyar E.V.R College (A),Trichirappalli-620 023, Tamil Nadu, Indiageodayalan89@gmail.com

Abstract:

Geography is one of the other disciplines about his relationships with the various aspects of the man and the environment. In recent years, a branch of this topic known as medical geography is associated with the health and wellness of the human body. The health problem in developing countries, such as India, is often a response to poverty. This study is carried out to develop a GIS for Deficiency Disease so as to enable us to identify areas of high Deficiency Disease incidence, towards developing a spatial strategy for control and eradication. The current study area located between Latitude 12°15'23''to 13°12'32''N and Longitude 78°24'16'' to 79°54'56'' E in the Northern part of the Tamil Nadu. The study area is situated in tropical climate region. The Data obtained from District Statistical Manual of the Year 2015-16 of the patients, affected by the various disease conditions that were reported in Government Hospital in Vellore District were taken. By using basic GIS mapping capabilities, GIS technology can create graphs and spatial explanations of complex data and it helps in understanding the distribution of various disease in different regions. The study results were reported using GIS applications like Arc GIS 10.1., MS- Excel and Statistical Package for the social scientists (SPSS) which may help in designing and mapping local strategies for controlling and predicting disease in future. However, they provide significant attention to the investigation, evaluation and improvement of health related policy and planning issues.

Keywords: GIS, Vellore, Doi's Method, Deficiency Disease, Diabetes, Combination

Introduction

GIS is defined as a constellation of software and hardware tools, capable of integrating digital images for the purpose of dealing with geographically localised data. Geographic information systems (GIS) are computer-based sets of procedures that capture, store, manipulate, edit, retrieve, analyse, model, and display data with spatial characteristics (Aronoff, 1989). GIS enable users to interactively query datasets, analyse spatial information, and present the results of these operations in maps, tables, and organized datasets.

The Application of Geographical information system (GIS.) Techniques have

gained importance during last two decades for deciding many issues related to Resource mapping, Monitoring and planning. The application of the Medical GIS is a link between bio-medical and Geography. GIS demand in the field of health is parallel to disease control advances. This is an invaluable approach, which identifies and connects people with medical impacts, health effects, risk factors and relationships between them. The other main strand within medical geography related to epidemiology the distribution and management of disease, driven by ecological theory and using diffusion modelling as one effective way of mapping and predicting the spread of disease (Gatrell, 2002). In addition, health systems can now display, analyse, and display multifaceted geo-location and attribute data through GIS tools, graphing applications, and vast data.

The World Health Organisation has defined health as a State of complete physical, mental and social well-being and not merely the absence of disease or Infirmity (WHO, 1965). The Deficiency Disease Analysis is branch of a Medical geography. It's an important new area of health research that is a hybrid between geography and medicine dealing with the geographic aspects of health and healthcare. Medical geography studies the effects of locale and climate upon health. It aims to improve the understanding of the various factors which affect the health of populations and hence individuals. It is also called health or medical geography. The idea that place and location may influence health is not exactly new. It is an old idea and a fertile one. Health and Medical geography is the application of geographical information, perspectives, and methods to the study of Health, disease, and health care.

Data Base and Methodology:

Deficiency Disease analysis is made with help of secondary data obtained from the Diseases affected Number of patient or treatment in government hospital at Vellore districts from Districts Statistical hand book year 2015-16. In order to determine the district wise Disease combination of vellore, Doi's Method was used for calculating the location quotient. Initially, the Doi's method was first (1957) used in Industrial Combination Structure in Tokyo, Japan. After 1959 modified used in crop combination. The present study adopted in Doi's Diseases combination in Vellore districts.

The following formula used to determine the various disease combinations in Vellore Districts. The Doi's formula may be expressed as:

Doi's Deficiency Disease Combination Formula $= \sum_D 2$

The collected information is processed and analysed using the GIS package ArcGIS. The spatial database and the attribute database for the entire Vellore district have been developed using MS EXCEL and adapted to ArcGIS as well as SPSS 16.0. By using ArcGIS Software create the different thematic map from the Deficiency Disease analysis from Doi's Combinations Method.

Deficiency Disease analysis: A Case Study of Vellore Districts

Geographical Back Round of the Study:

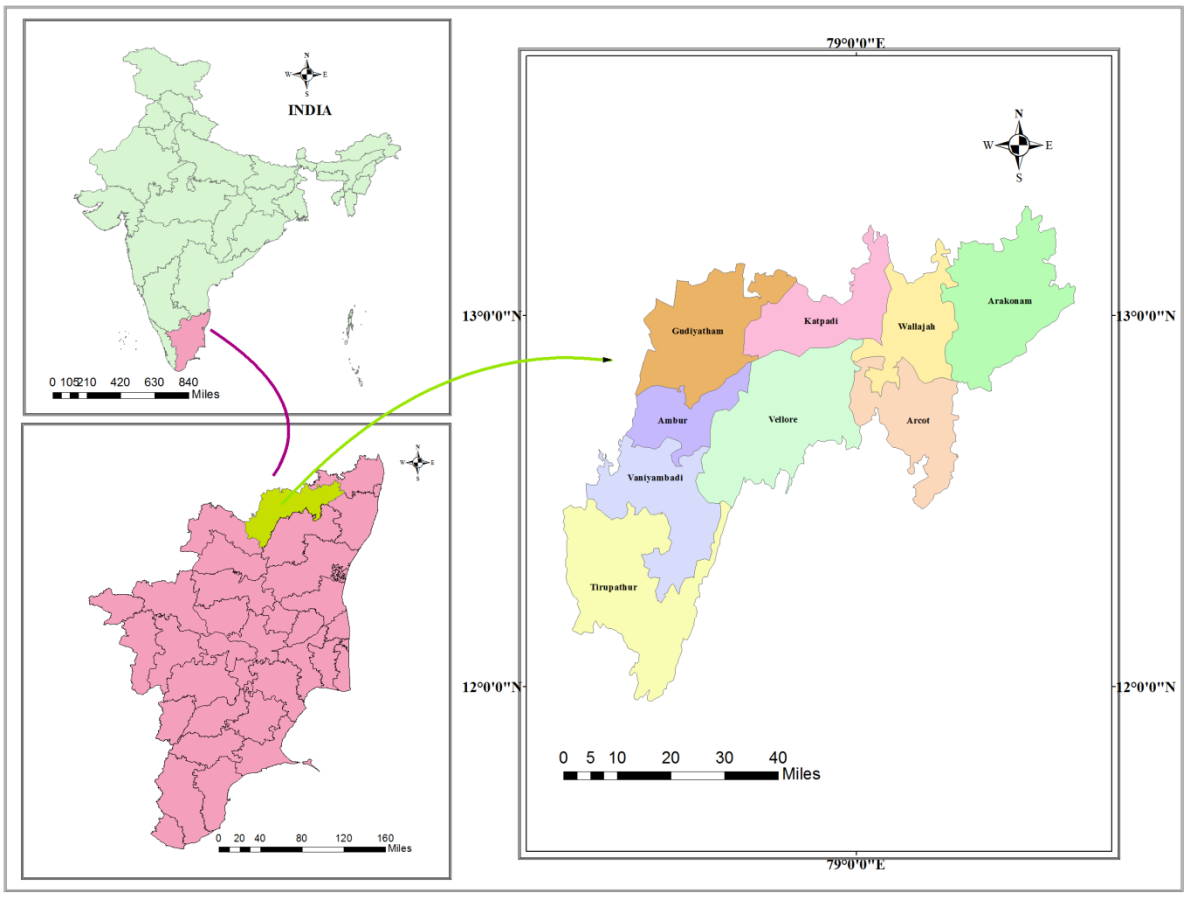

Figure No.: 1 Study area

The study area lies between Latitude 12°15'23''to 13°12'32'' N and Longitude 78°24'16'' to 79°54'56'' E and bounded by Chittur District of Andhra Pradesh in the north and north-west. Thiruvallur district is the North East, Kancheepuram district in the south east, Thiruvannamalai district in the South and Dharmapuri district in the west and south west. Vellore District which was carved out of the erstwhile North Arcot district during 1989 is located in the north-western part of Tamil Nadu and has a total geographical area of 5920.18 square kilometres with 3928106 populations. The study area enjoyed tropical climate. The highest and lowest temperature are 36.8 to 18.2 ^{0}C. The annual normal rainfall for the study area is 949.8 mm. The drainage of the study area is mainly Palar River and Ponnai River. The area is a chronic polluted area and one of the biggest exporting centres of tanned leather. Many small – scale tanneries are processing leather in the study area and discharging their effluents on the open land and surrounding water bodies. The taluks of Gudiyatham, Katpadi, Wallajah, Arakonam, Arcot, Vellore, Vaniyambadi, Ambur and Tirupathur from the area shown in figure 1.

Result and Discussion on GIS Application in Deficiency Disease Analysis:

Disease Ranking:

The percentage of Deficiency Disease is given in figure Number 1 and 2.

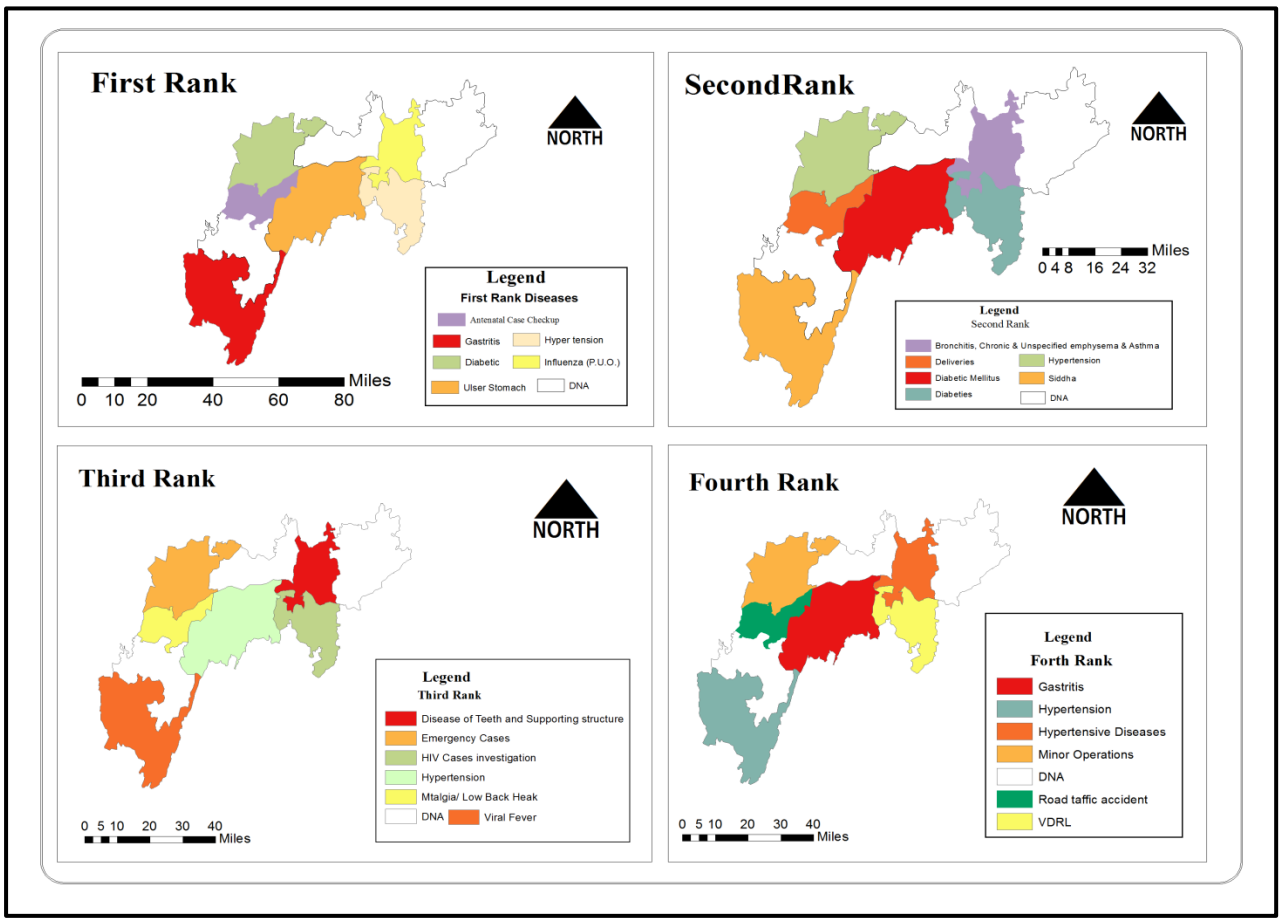

Fig. No. 2 Diseases Ranking

Source: Compiled by Author based on G – Return data (2015-2016) of District Statistical Office websites

First Rank Diseases: The first rank of 6 diseases affected in the study area like Ulcer Stomach, Gastritis , Diabetic , Hypertension, Influenza (P.U.O.) , Antenatal Case Check-up. This disease occupiying the highest percentage of total area in each of the component areal units could be choson, no matter what percentage it occupies in the gross diseased area. With the help of this method, the distributional pattern of first ranking diseases.

Second Rank Diseases: On the basis of Second ranking diseases, seven types of diseases affected area is dominated by research areas like Vellore occupied in Diabetic, Tirupathur in Siddha, Gudiyatham taluk in Hypertension, Arcot taluk in

Diabeties, Wallajah taluk in Bronchitis, Chronic & Unspecified emphysema & Asthma and Ambur taluk in Deliveries diseases affected in these year. . (Figure No.: 3)

Third Rank Diseases: Third rank diseases dominated in eight disease from the study area. The Vellore districts occupied in Hypertension, Tirupathur in Viral Fever, Gudiyatham Emergency Cases , Arcot in HIV Cases investigation, Wallajah in Disease of Teeth and Supporting structure and Ambur in Low Back Heak (Figure No.: 3).

Fourth Rank Diseases: In the fourth rank estimate, there were six diseases from the study area. It is Gastritis, Hypertension, Minor Operations, VDRL, Hypertensive Diseases and Road traffic accident (Figure No.: 3).

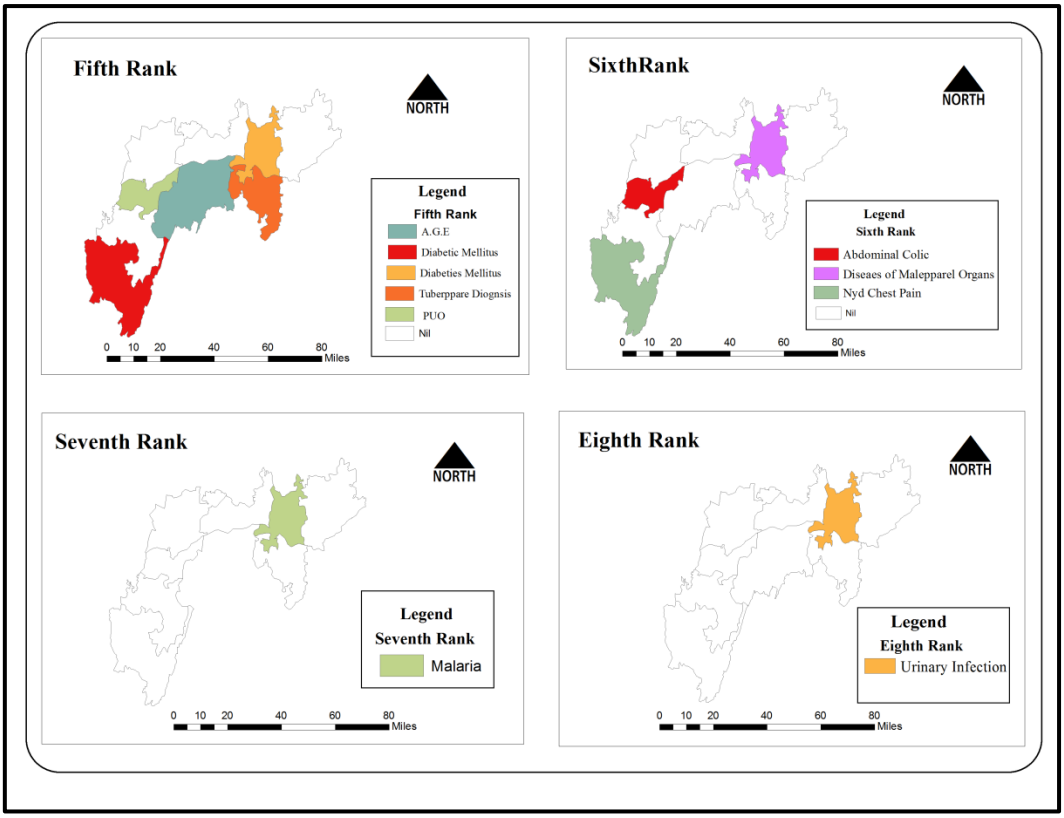

Fig. No. 2 Diseases Ranking

Source: Compiled by Author based on G – Return data (2015-2016) of District Statistical Office

Fifth Rank Diseases: The fifth rank of 5 diseases dominated the study area (Figure No.: 3).

Sixth Rank Disease: The sixth rank of 3 diseases affected in the study area. (Figure No.: 3)

Seventh and Eighth Rank Arrays: The 7th and 8th rank of 1 diseases found the study area (Figure No.: 3).

Doi's Deficiency Disease Combination:

The Doi's An Abrided of Deviation Analysis Table can be seen by making use of actual percentages under different Deficiency Disease Combination at case study of Vellore district. The ranking Disease per cent and cumulative percentage are as shown the Doi's An Abrided of Deviation Analysis Table value (Annexe – I) find out Deficiency Disease Combination.

This technique shows that higher ranking crops have high percentage (above 10 per cent), the lower ranking element with less than 5 per cent which are usually excluded from the combination. This technique is most profitably applied to such a situation as is found in the crops combination in which interrelationship exists between the component combinations. Using this technique, Disease which has cumulative percentage is less than 50 are included in combination; or the critical value for all the crops at different ranks against 50 in Zero. Therefore, the scale of cumulative percentage starts from above 50 percentages which contributed as higher rank may be 1st three combinations.

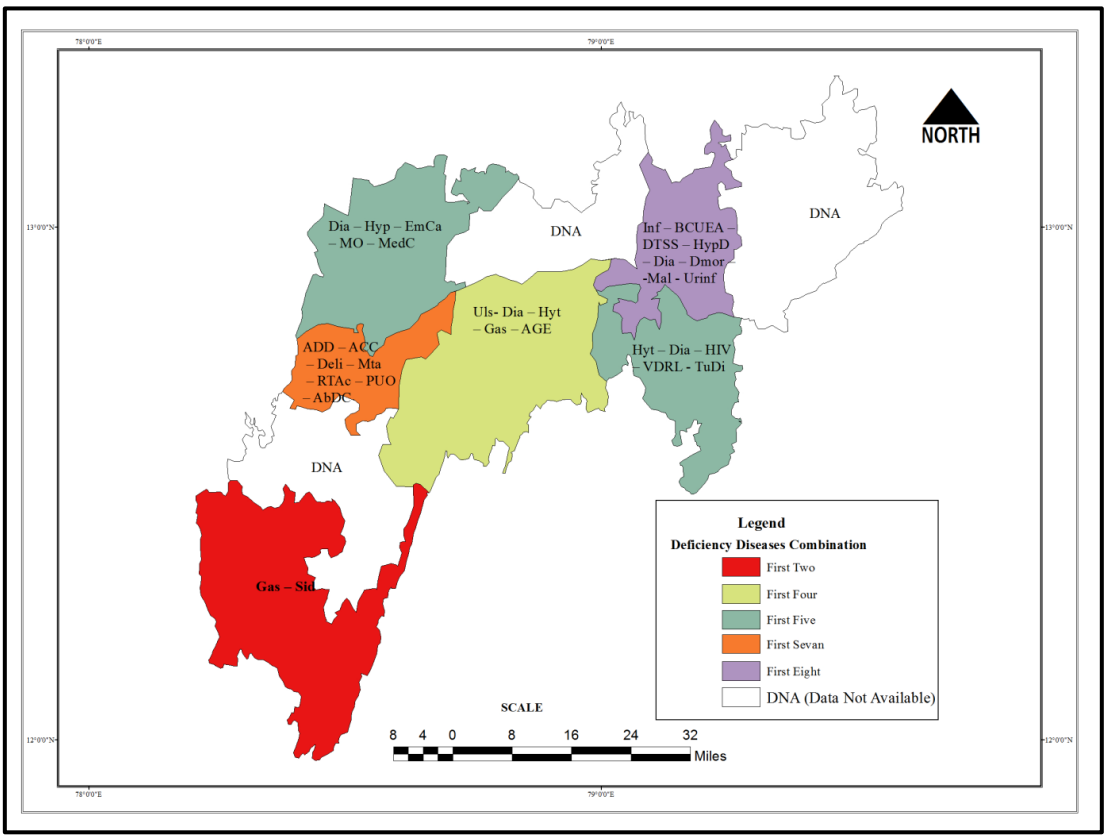

Fig. No.: 4.
Doi's Deficiency Disease Combination Method
Source: Author.: Doi's Method.

Mono Culture: Mono ranking diseases are occupied by the largest percentage of total diseases in Gudiyatham, Wallajah, Arcot, Vellore, Vaniyambadi, Ambur (Pernambet), Tirupathur areas. It comes out of the 6th regions of the study area in the 6th regions. This region combined in Diabetic, Influenza (P.U.O.), Hyper tension, Ulcer Stomach, ADD and Gastritis the area. The disease diversification is low in this region. Therefore, this method helps the diseases to determine the dominant areas of the region in the study area.

First Two Disease Combination:

The resulting first two diseases combinations present have been shown in the figure : 3. The Gudiyatham, Wallajah, Arcot, Vellore, Vaniyambadi, Ambur (Pernambet), Tirupathur, on the study area in 6 regions. The relative strength of the first two combination diseases are Diabetic-Hypertension, Influenza (P.U.O.) - Bronchitis, Chronic & Unspecified emphysema & Asthma, Hyper tension – Diabetes, Ulcer Stomach - Diabetic Mellitus, Antenatal Case Check-up – Deliveries, Gastritis - Siddha in 6 regions from the study area.

First Four Disease Combination:

The four disease combinations were found in Gudiyatham. It consists Diabetic-Hypertension, Emergency (accidental or suicidal) Cases and Minor Operations.

First Five Disease Combination:

Three regions have five disease combinations. The disease conditions found in these regions are given in figure: 3 which show Ulcer Stomach, Diabetic-Hypertension-Gastritis, A.G.E, Hypertension, Diabetes, HIV Cases investigation, VDRL are dominated in the five disease combination.

First Seventh and Eighth Diseases Combination:

The seventh and eighth diseases combination are Wallajah and Ambur on the vellore district in Tamil Nadu. This region diseases combination is Antenatal Case Checkup, Low Back Heak-Road traffic accident-PUO-Abdominal Colic and Influenza (P.U.O.)-Bronchitis, Chronic & Unspecified emphysema & Asthma-Disease of Teeth and Supporting structure-Hypertensive Diseases-Diabetes-Disease of malepparel organs-Malaria -Urinary tnact infection in the study area.

Conclusion:

Current research has demonstrated the usefulness of GIS in mapping of defective Doi's Deficiency Disease Combination Method, based on the events of the positive phenomenon. The use of GIS combo inspection research, tool and technology in defective diseases lasts for other Deficiency Disease Combination. Mapping can be made in designing local strategies for controlling and preventing disease. Although Vellore, Tirupathur, Gudiyatham, Arcot, Wallajah and Ambur regions still

considerable amount of disease for Mono to eight combination. The Doi's An Abrided of Deviation Analysis Table can be seen by making use of actual percentages under different diseases in the Vellore district for 2015-16. The ranking diseases per cent and cumulative percentage are as shown the Doi's An Abrided of Deviation Analysis Table value (Annexe – I). Mono diseases are located in the region 6. The first two, four, seven and eight diseases showed that combinations of parts of the study area and 1 in 6 regions and first five diseases found in 2 regions out of 6 regions from current research.

Reference:

1. Ali, Mohammad (1978): "Dynamics of Agricultural Development in India". Concept Publication, Private Company -New Delhi.
2. Ali M, Emch M, Tofail F, Baqui AH.Implications of health care provision on acute lower respiratory infection mortality in Bangladeshi children. Soc Sci Med 2001;52:267-77.
3. Anderson V, Skrizhevskaya E.Solving medical geographical problems with GIS: the case of South Ukraine. In: Geographical information: Second Joint European Conference & Exhibition on Geographical Information, Barcelona, Spain. Amsterdam: IOS Press, 1996; 857-61.
4. Briggs DJ, Elliott P.The use of geographical information systems in studies on environment and health. World Health Stat Q 1995;48:85-94.
5. Dayalan N. , Analysis of The Industrial Combination Structure based on Doi's Method: Case Study of Tamil Nadu Cauvery Basin (India). Cloud Publications, International Journal of Advanced Earth Science and Engineering 2017, Volume 6, Issue 1, pp. 557–566 ISSN: 2320–3609, Crossref: 10.23953/cloud.ijaese.297
6. Doi K, "The industrial structure of Japanese Perfecture Proceding", I. G. U. Regional conference in Japan, 1959, 310-316.
7. Dunn C. GIS in epidemiology. London: Association for Geographic Information, 1992:20. (Education, training and research publication no. 5).
8. Environmental Systems Research Institute, Inc. ARC/INFO Version 8.0.1 (1999).
9. Eastman JR.Idrisi for Windows: user.s guide. Version 2.0. Worcester, MA: Graduate School of Geography, Clark University, 1997:1-19.
10. Emch M, Ali M.Spatial and temporal patterns of diarrheal disease in Matlab, Bangladesh. Environ Plann A 2001;33:339-50.
11. Howe G.M. (1977) : A World Geography of Human Diseases.Academic Press-London, Page 20.
12. Hunter JM.The geography of health and disease. In: Hunter JM, editor. The challenge of medical geography. Chapel Hill, NC: University of North Carolina, 1974:1-3. (Studies in geography, 6).
13. Jacquez GM.GIS as an enabling technology.In: Gatrell AC, Löytönen M, editors GIS and Health. London: Taylor & Francis, 1998:17-28. (GISDATA series,
14. Jasbir, S., & Dhillon, S. S. (1984). Methods of Agriculture Regionalization. In *Agricultural geography* (3rd ed., pp. 213-297). New Delhi, India: Tata McGraw-Hill.
15. Majid Husain (1996). *Systemmatic Agricultural Geography* (1996 ed.). Jaipur, India: Rawat Publications
16. McGlashan ND. Medical geography: an introduction. In: McGlashan ND, editor. Medical geography: techniques and field studies. London: Methuen, 1972:3-15.
17. May JM. The ecology of human disease. New York: MD Publications, 1958:1-34. 4.May

JM.Medical geography: its methods and objectives. Soc Sci Med 1977;11:715-30.

18. May J.M. (1950) Medical Geography its methods andobjectives^ Geographical review, 40(10), pp 11-41.
19. Mc GlaShan N.D. (1966) The Medical Geographer* s Work"'International Pathology July 1966, Page 61-63.
20. Misra R.P. (1970) * Medical Geography of India. NationalBook Trust, New Delhi, Page 3,12.
21. Mayer JD.Relations between two traditions of medical geography: health systems planning and geographical epidemiology. Prog Human Geogr 1982;6:216-3
22. Mayer JD.Medical geography: an emerging discipline. JAMA 1984;251:2680-3.
23. Mayer JD, Meade MS.A reformed medical geography reconsidered. Profes Geogr 1994;46: 103-6.
24. Meade MS, Florin JW, Gesler WM.Medical geography. New York: Guilford Press, 1988:3-93
25. Myaux JA, Ali M, Felsenstein A, Chakraborty J, de Francisco A. Spatial distribution of watery diarrhoea in children: identification of .risk areas. in a rural community in Bangladesh. Health Place 1997;3:181-6.
26. Pandurkar R.G. (1981) t Spatio temporal distribution ofnsome diseases in Maharashtra Unpublished Ph.D. Thesis, Shivaji University, Kolhapur, Page 32
27. Park and Park (1979) i Preventive apd social medicine -iMrs. Bevarasidas Bhanot, Jabalpur, Page 41.
28. Paul BK.Approaches to medical geography: a historical perspective. Soc Sci Med 1985;20: 399-409.
29. Pantazis ND, Cornélis B. Designing and implementing a GIS in an international context. Trans GIS 1997;1:301-20.
30. .Pantazis D, Donnay JP.La conception de SIG: méthode et formalisme. Paris: Hermes, 1996. 343 p.
31. Pyle GF.International communication and medical geography. Soc Sci Med 1977;11:679-82.
32. Pyle GF.Elements of disease ecology.In: Pyle GF, editor. Applied medical geography. New York: Wiley, 1979. 107 p.
33. Rushton G, Lolonis P.Exploratory spatial analysis of birth defect rates in an urban population. Stat Med 1996;15:717-26.
34. Scholten HJ, de Lepper MJC.The benefits of the application of geographical information systems in public and environmental health. World Health Stat Q 1991;44:160-70.
35. Stamp L.D. (1965) The Geography of life and death,Collins, London, Page 15
36. www.velloredistrict.tn.nic.in