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RESEARCH ARTICLE

Spatial Distributional Patterns of Public Healthcare Centers in Bidar District: Using Nearest Neighbour Analysis

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Abstract

The spatial distribution of healthcare centres is uneven as the human population on the earth's surface and the factors for such uneven distribution is almost similar. The uneven distribution of health centres are observed even at micro level not only between the regions but within the region also depending up on the demand for the health care centers and the supply of the patients. This paper aimed to map the spatial distributions of public healthcare centers in Bidar District. It would assist the stakeholders and responsible authorities in the planning for health service delivery. The Secondary data related to health care centres are collected from various offices like District Health Office and Taluk Health Office. The base map of study area has been geo-referenced and digitized using ARC GIS software. The Global positioning system (GPS) was adopted to take the coordinate of all the existing Public health centers in the study area. The nearest neighbour was used to identify the spatial patterns of distribution of Public healthcare service centers. Whether these health centers were distributed spatially, clustered, dispersed or randomly. The results of the average nearest neighbour analysis revealed that, the distribution of public health centers are randomly distributed. The Rn value of the health centres in the district is 1.2300. There is a significant difference in the spatial patterns of distribution of public health centres in Bidar district.

Keywords: Spatial; Health centers; Nearest Neighbor Analysis; GIS; GPS Introduction:

Introduction

The spatial distributional pattern and location of health center is required to enhance optimization of effectiveness and resources utilization among service providers. The study of regional variations in the distribution of social services (like healthcare) has captured the interest of geographers, planners and other scientists because of their general interest in the spatial variation of phenomena on the earth's surface. In particular, the question of access to sources of human need or want satisfaction stresses the importance of location and distance. When dealing with problems of space, mapping is a geographical research tool used to compare the spatial distribution of a set of features to a hypothetically-based random spatial distribution.

These spatial distribution patterns are of interest to many areas of geographic research because they can help to identify and quantify patterns of features in space so that the underlying cause of the distribution can be determined. Spatial techniques GIS is a technology with unique and valuable application for planners, geographers, social scientist and in many fields. So, GIS is becoming increasingly popular in health care research in recent years.

Objective

This study aimed to understand the spatial distributional patterns of public healthcare centers in Bidar District.

Study area

Bidar District is a top of hill city located on the Deccan Plateau, in the north-eastern part of Karnataka State in India. Bidar District lies between 17^0 to 35^1 N to 18^0 to 25^1 N Latitude and from 76^0 to 42^1 E to 77^0 to 39^1 E Longitudes. Bidar District covers an area of 5448 sq.km and accounts for 2.84% of the state's total geographical area. It's bordered by Nanded and Osmanabad District of Maharashtra state on the Northern side, south by Gulbarga District of Karnataka state, Latur and Osmanabad Districts of Maharashtra state, on the western side and Nizamabad and Medak districts of Andhra Pradesh State on the eastern side. Totally, Bidar District consists of five taluks, such as, Aurad, Basavakalyan, Bhalki, Bidar and Humnabad with 30 hoblies, 175 Grama Panchayaths, 7 towns 6 Municipalities and Bidar being the head quarters of the district. District consists of 621 villages, out of which 599 inhabited and 22 uninhabited villages. As per 2011 census, the population of the Bidar district is 1,703,300 of which male and female were 870,665 and 832,635 respectively.

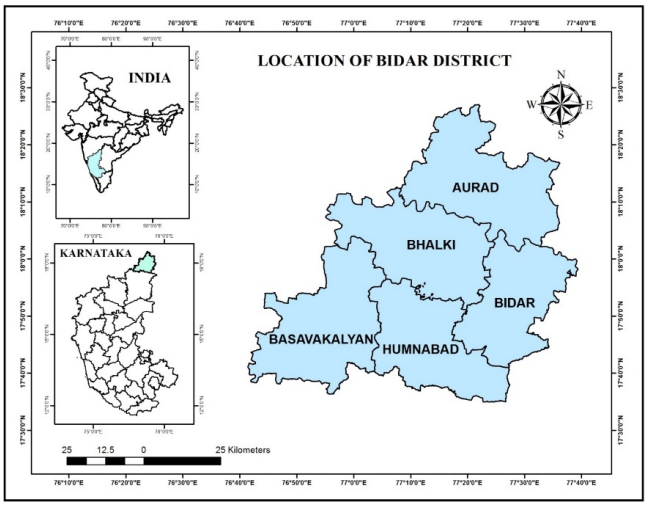

Fig. 1. Location Map of Bidar District

Methodology

This study is based on availability of data related to health care services in the district and geographic accessibility of health services. The study was conducted in five taluks of Bidar district. The Secondary data related to Public healthcare centres are collected from various offices like District Health Office and Taluk Health Office. The Spatial Data Such as, Toposheets of the study area at a scale of 1:50,000 are collect from Survey of India and to generate the spatial village maps involves the extraction of taluk boundaries from topographical maps. The base map of the study area has been geo-referenced and digitized using ARC GIS software 10.3, to show the spatial distribution and accessibility of public healthcare centers. The Data for the study were collected from primary sources also. The Global positioning system (GPS) was adopted to take the coordinate of all the existing public health centers in the study area. "Nearest Neighbour Analysis (NNA) was the inferential statistical used in analyzing the data. This was used in establishing the distribution pattern of health facilities in the study area. "Nearest Neighbour Analysis (NNA) is the method of exploring pattern in Locational data by comparing mean distances".

Results and Discussions

Spatial Distributions of Public healthcare Centers in Bidar District

The Existing government healthcare centres can be organized in different hierarchical order as the Health Sub Centre, Primary Health Centre including Community health care, General Hospitals and District Hospital. They are located on the basis of economic feasibility and requirement of the people. The spatial distribution of healthcare centres of Bidar District has been analyzed for all five taluks. The uneven distribution of health centres are observed even at micro level not only between the regions but within the region also depending up on the necessity of the health care centers and for the people. So far as the public healthcare centers of the Bidar district is concerned, it comprises one District Hospital, Four General/Taluk hospitals, 57 Primary Health Centres out of that 33 are working 24x7 and 8 Community Health Centres. The distribution of Public healthcare centres as been shown in the following Table 1 and Figure 2 .

The Present hospitals system varies in size and kinds of medical care services, where one can get all types of treatments that are needed by a patient. In the study area, the existing public healthcare centers can be structured in different hierarchical order to study the optimum use of available resources in different health centers.

Table 1. Spatial Distribution of Public Healthcare Centres in Bidar District

Sl. No.	Taluks	Population	Health Institutes			
			District Hospital	Taluk Hospitals	CHC	PHC
1	Aurad	278400	0	1	2	9
2	Basavakalyan	345247	0	1	2	12
3	Bhalki	277350	0	1	1	12
4	Bidar	469941	1	0	0	14
5	Humanabad	332362	0	1	3	10
Total		1703300	1	4	8	57

Source: District Health Office, Bidar District 2015

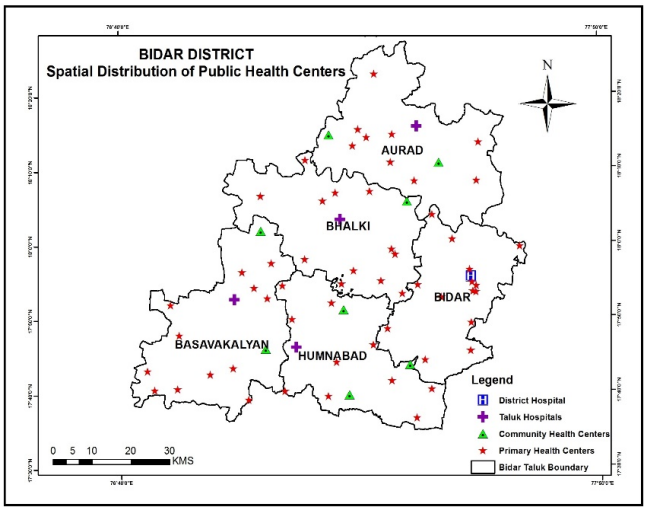

Fig. 2. Spatial Distribution of Public Healthcare Centers

Spatial Pattern of Health Centres

The spatial distribution of health centres unevenly distributed in the study area. The study of the spatial distributional pattern of health centres is an important aspect in Medical/health care geography. In the present study Nearest Neighbour Technique has been used to observe how these health centres are distributed in the district. The 'Nearest Neighbour method, was firstly developed by two botanists, Clark and evens (1954), they have used this techniques to measures the pattern of incidence of different species of plants in a region. Later on, geographers have widely used this technique in order to study the distributional pattern of the places and other phenomena in different geographical regions of the world. As a result, the researcher has using this technique to study the spatial distribution pattern of health centres in the study area. The following formula is as

$$Rn = 2\,\bar{d}\sqrt{\frac{n}{A}}$$

Where: Rn = The description of the distribution

2d = The mean distance between the nearest neighbours (Kms)

n = The number of points (Health Centers) in the study area

A = The area

By using this formula, Rn values for Five taluks of the district have been calculated.

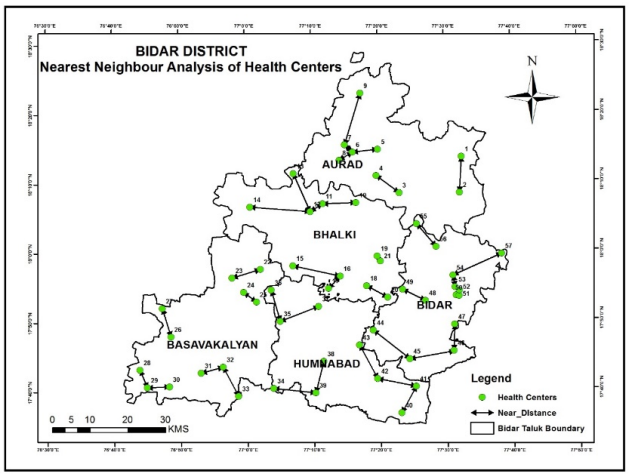

Fig. 3. Nearest Neighbour Analysis of Health Care Centres in Bidar District

The Nearest Neighbour analysis statistics for all five taluks of Bidar district were derived from the distance between nearest health centers. The Rn value of the district is 1.2300, it shows that these health centres are randomly distributed, these can be observed in the Figure 3. Table 2 reveals the fact that, all most all the taluks are having a tendency of approaching towards random pattern of distribution of health centers with the Rn values of 1.23.

Table 2. Talukwise Rn Values of Health Centers in Bidar District

Sl. No	Taluk	Rn Value	Pattern
1	Aurad	1.3325	Randomly Distributed
2	Basavakalyan	1.4557	
3	Bhalki	1.6990	
4	Bidar	1.110	
5	Humanabad	1.7007	
Total		1.2300	

Source: Field Survey and Compiled by Author

Conclusion

From the above analysis it can be concluded that, healthcare centres are not equally distributed among different taluks of Bidar District. Public Healthcare centers are not increasing

with the population so there we can identify gap between them. The study reveals that, though the numbers of centers appear to be enough but they are inadequate. The Public health care centres of all the taluk are randomly distributed (Table No: 2). The Rn value of the health centres in the district is 1.2300. To reduce the imbalance in the distribution of public health centres, the establishment of new health care centres should be based on structured criteria and geographical aspects and also transportation is responsible for emergence of new health centers. These health centers are the mirror of the rural mass in the study area.

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