

Hierarchical Assessment of Tribal Health Service Centres According to Average Population Per Weightage

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Abstract:

Background: Health is a vital indicator of regional development, and the efficiency of primary health services plays a crucial role in improving community well-being. The present study focuses on evaluating the spatial distribution and intensity of diseases in rural areas through the performance of Primary Health Centres (PHCs) and Rural Hospitals. It aims to understand the level of healthcare accessibility and the relationship between disease occurrence and available medical facilities. The study was conducted in the selected region comprising 38 Primary Health Centres and 5 Rural Hospitals. The area is predominantly rural, where health infrastructure serves as the first point of contact between the population and the healthcare system. Each PHC covers a distinct hinterland, and variations in service delivery were observed across different locations.

Materials and Methods: The main objectives of the study were to (1) assess the performance of PHCs and Rural Hospitals, (2) analyze disease intensity and morbidity rates, and (3) establish a link between the hinterland population and healthcare service distribution. A detailed field investigation was undertaken using three structured questionnaires—household, village, and PHC-level surveys. Data on patient numbers, types of diseases, and healthcare facilities were collected through direct observation and official health records. The Kendall's Rating Co-efficient approach was applied to measure disease intensity, and the composite weightage method was used to evaluate the service area and healthcare reach of each PHC.

Results: The analysis revealed notable spatial disparities in disease intensity and healthcare accessibility. Some PHCs exhibited higher patient loads and greater disease intensity, indicating pressure on limited medical resources. Centres with lower ranking co-efficient values reflected higher disease severity.

Conclusion: The study highlights significant variations in disease intensity and healthcare service distribution across rural areas, emphasizing the need for balanced healthcare planning and improved accessibility to primary health services.

Keywords: Primary Health Centres, Disease Intensity, Rural Health, Healthcare Accessibility, Field Survey

Date of Submission: 09-02-2026

Date of Acceptance: 19-02-2026

I. Introduction:

In the lives of the villages, rural service centers play an essential role. A services center's primary function is to provide service to the surrounding region. A service center may also serve as a collecting and distribution point. "A central place theoretically enjoys a central location, as its name indicates in a given area of a region and provides variety of functions or services not only to its own population but also to that of its own immediate contiguous surrounding area" (Singh S. B, 1977). According to Jefferson, (1931) "Central place can-not be a place of manifold activities for surrounding countryside". Walter Christier, (1933) designated the functions of services performed for the surrounding countryside as central functions and the places wherein such services are performed as central places".

"The centrality of a services is importance in the provision of goods and services to the surrounding hinterland population is indicated by the number of services it provides and by the proportion of these services supported solely by the tributary population" (Johnston, 1966). Agro-service centers, educational service centers, health service centers, and other types of service centers may be categorized based on the tasks they serve. A tribal health care center is a location that provides health services to the tribal hinterland around it. In this research, tribal health service centers are defined as rural hospitals and primary health centers that offer health services to the surrounding countryside. The tribal communities that are served by these medical facilities are referred to as tribal health service centers.

II. Review Of Literature:

The impoverished tribal communities of India have much poorer indices of health than the general population. Many tribal people live in isolated rural hamlets in hilly, forested or deserted areas where they are more vulnerable to disease by illiteracy, physical conditions, malnutrition, poor access to drinking water and lack of personal hygiene and sanitation. A literature review is an integral aspect of the area of study. This investigator made an attempt to study the literature.

Medical Geography is another name for Geography of health. Medical geography is a subdiscipline of human geography that explores the relationship between the environment and health, as well as the relationship between lifestyle and health and the geographical variation in health status and health treatment (**Misra, 2007**). In Western countries, the subject is well-developed. Due to a lack of reference material, virtually little study has been done in poor countries. The subdiscipline was founded by Jacques May, the pioneer of medical geography in the United States, who wrote 'The Ecology of Diseases' (1985). Medical geography emerged in the late nineteenth and early twentieth centuries (**Cubitt, S, 2002**). Earlier research was primarily descriptive in nature, focusing on disorders. Although medical researchers have studied the disorders extensively, little is known about their regional distribution.

The study of 'aerial' or spatial patterns of disease is a simple definition of Medical Geography. Medical geography, according to **Armstrong**, is concerned with the distribution and comparability of various illness indicators in the human population, as well as the interrelationship with other elements of space's physical, biological, and cultural environment. **McGlashan** stated that a medical geographer's responsibilities include the preparation and collection of data, as well as mapping them to show where a specific disease is present and applying objective statistical tests to the distribution to determine whether the pattern is likely to have occurred by chance; measuring the degree of correspondence between diseases and then applying tests to determine whether any spatial associations could be causative; and measuring the degree of correspondence between disease and then applying tests to determine whether any special associations could be causative.

However, in recent decades, a number of publications on medical geography have appeared, particularly in the United Kingdom, the United States, Germany, Belgium, Japan, India, and Australia. The geographical characteristics of people's health are explicitly addressed in both Western and Russian studies. Learmonth's work in medical geography in India in general, as well as his study on the recurrence of malaria in India in conjunction with Akhtar, were significant contributions to medical geography, particularly on disease ecology. Howe's work on environmental factors and cancer and other diseases in the United Kingdom, as well as his national Atlas of Disease Mortality in the United Kingdom, are both noteworthy.

Some Maharashtra universities have also conducted study on health geography. Especially from Kolhapur's Shivaji University. On the Spatial Distribution of Major Diseases in Maharashtra, by R.G. Pandhurkar, FMA Shaikh on the Spatial Distribution of a Few Diseases in Solapur District Cities, On the Spatial Distribution of Diseases and Health Care Facilities in Kolhapur's Rural Areas, by D. B. Gambhire, Spatio-Temporal Analysis of Major Diseases in Vidharbha, by K. B. Patil J.D. Mulik on Communicable Disease Spatial Analysis in the Konkan Region, Geo Medical Study of Some Water-borne Diseases in Maharashtra State, R.R. Gharge, A Geographical Analysis of Some Diseases in Sindhudurg District, by A. G. Bandekar, N.J. Patil on Geo Medical Studies of Some Diseases in Maharashtra's Pune Division. Geographical Analysis of Diseases and Health Care Facilities in Kolhapur District, etc., by M. T. Hajare Under the direction of S. R. Choudhari, some work on tribal and rural health and health facilities was also done at North Maharashtra University, Jalgaon. For example, in India, D. S. Suryawanshi (2002) published Geographical Epidemiology and Spatial Patterns of Health Services in the Tribal Area of the Western Satpura Region, and Suresh Alizad published Nutritional Status and Deficiency in the Tribal Area of the Western Satpura Region. V. C. Ahirrao's research on the spatial distribution of health care facilities and their planning in the Tribal of Western Satpura Region, India is one of them.

III. Study Area:

The study area is located in the north-western and south west region of the Nashik District. It extends from 19° 44' 57" to 20° 43' 55" north latitudes and 73° 14' 05" to 73° 06' 57" east longitudes. Study area covers an area of 4581.98 sq. km., which is 29.40 % of the geographical area of the district. It is surrounded by Deola and Chandwad tehsil in the east and the north-east, Gujrat state in the north, Palghar districts of Maharashtra State to the south-west, Igatpuri tehsil to the south. It consists of 05 tehsils, namely Peint, Dindori, Surgana, Kalwan and Trimabkeshwar. The population of the region is 976092. It includes 760 villages and 40 PHC.

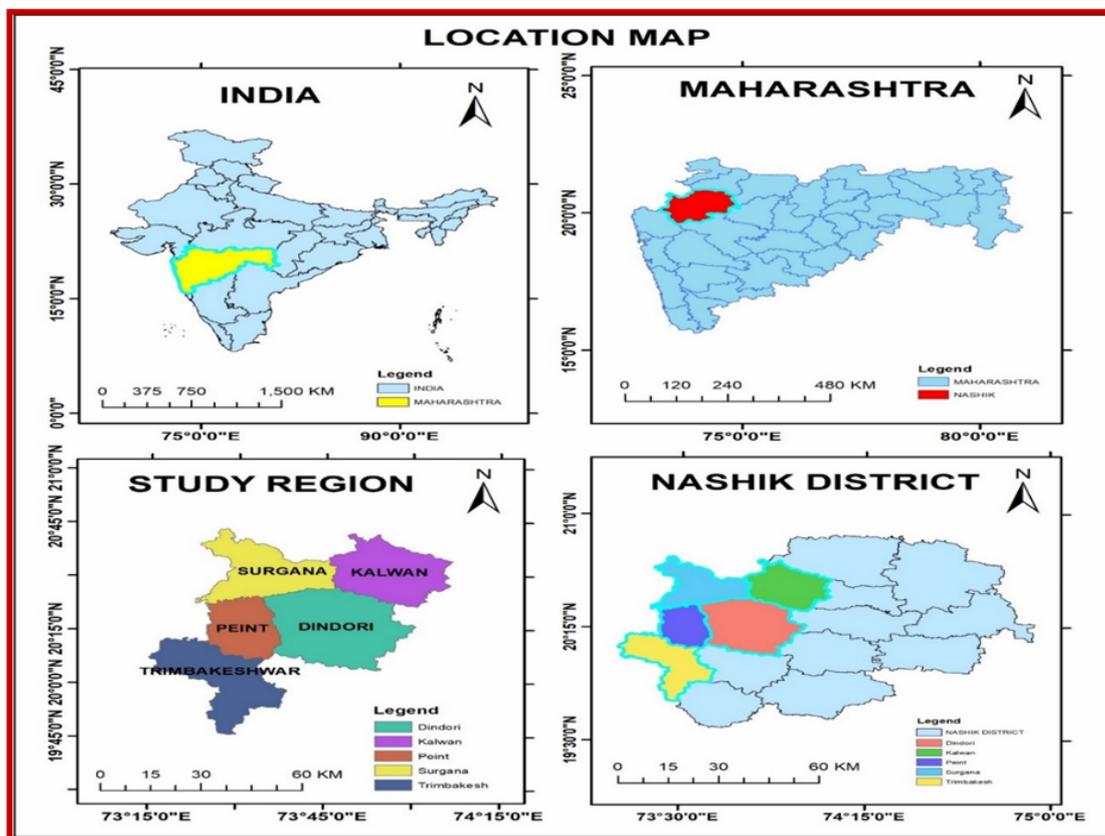


Fig. No. 01

IV. Objective

- 1) Assess the performance of PHCs and Rural Hospitals,
- 2) Analyse disease intensity and morbidity rates.
- 3) Establish a link between the hinterland population and healthcare service distribution.

V. Methodology

A thorough field investigation has been carried out in order to obtain this material. Information on household, village, and primary health center conditions has been compiled using three separate forms of questionnaires. A total of 38 Primary Health Centers, 5 Rural Hospital were assessed, and data on the number of patients treated has been compiled. Primary health care centers in the research area are directly inspected, and data on infectious patients with different diseases was obtained from primary health center and Rural hospital. The average area serviced by each composite weightage can be used to investigate the scope of the health care. Here, an endeavor is made to establish a link between the hinterland and the health-care services offered in the service centers. Average population per composite weightages are used to establish the relative relevance of health services and thus the level of health service centers. The following formula is used to calculate the average population per composite weightage.

Average Population per composite weightage= Tpa/Cwa

Whereas,

TPA: Total population served by a primary health centre.

CWA: Composite weightages of a primary health centre.

VI. Result And Discussion

Hierarchy of Tribal Health Service

The graphical method is used to determine the hierarchy of tribal health service centers. All of the service centers are ordered in descending order based on composite weightages. The weightages of composites are displayed against their ranks. The graph (Figure No.) depicts the key breaks, which group the tribal health service facilities into 04 orders.

Table No. 1 Tribal Tehsil of Nashik District: Altitudinal Belt-Wise Hierarchical Distribution of Tribal Health Service Centers according to their Composite Weightages

Orders	300 to 400 M.		400 to 500 M.		500 to 600 M.		600 to 700 M.		Above 700 M.		Region	
	No. of PHC	%	No. of PHC	%	No. of PHC	%						
I	-	-	-	-	01	25	01	05.56	-	-	02	4.65
II	-	-	-	-	-	-	02	11.11	01	10	03	6.98
III	02	50	01	14.29	-	-	07	38.89	04	40	14	32.56
IV	02	50	06	85.71	03	75	08	44.44	05	50	24	55.81
TOTAL	04	100	07	100	04	100	18	100	10	100	43	100

Source- Computed by Researcher, 2020-21

First Order Tribal Health Service Centre:

In the study region, primary health centers such as Dindori RH and Surgana RH may be considered the best health service centers. These service centers have a combined weightage of 101.55 and 81.97 respectively. They have all of the necessary infrastructure and medical services, and they are both community health centers. 4.65 percent of hierarchical distribution health service centers have a composite weightage of 1st order.

Second Order Tribal Health Service Centres:

Peint RH, Trimbak SDH and Abhona RH are in three second-order tribal health service centers. All of these centers have weights ranging from 68.78 to 63.85 All of these locations are community health centers either tehsil headquarters or big tribal villages with greater transit connections.

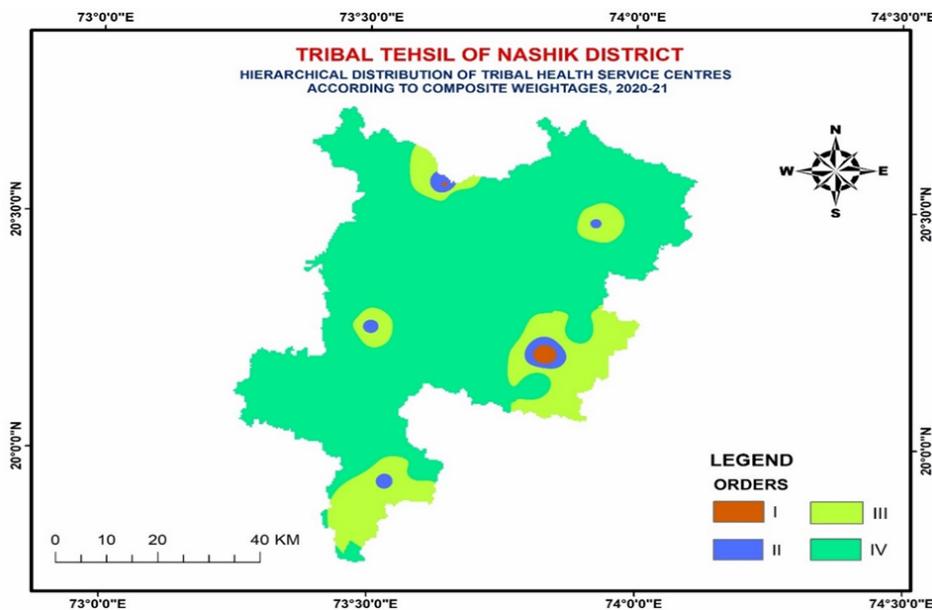


Fig. No. 2

Third Order Tribal Health Service Centres:

Tribal villages such as Khedgaon, Kanashi, Anjaneri and other 10 PHC are included in the third order health service centers. The composite weightages of these service centers range from 47.81 to 30.45 primary health centers. with the exception of Mohadi PHC, are the only remaining options. They are better served by improved road accessibility, allowing them to be classified as third-order centers.

Fourth Order Tribal Health Service Centres:

Twenty-three primary health centers are featured in this list. Ambe, Karanjali, Amboli and other 20 primary health centers are prominent among them. Ambe major health clinics are placed at the near tehsils' headquarters, whereas Karanjali and Amboli serve as community health centers, and the remaining large tribal hamlet settlements are underserved areas with a lack of infrastructure and health-care services.

The composite weightages used in this section of the study are good indicators of the spatial distribution of health-care service availability in the study area. It is attempted to comprehend the importance of tribal health care. The average population per composite weightage and the average area per composite weightage are used to classify primary health facilities.

Health Service Centres According to Average Population Per Weightage:

Average population per composite weightages are used to establish the relative relevance of health services and thus the level of health service centers.

The following formula is used to calculate the average population per composite weightage.

Average Population per composite weightage= Tpa/Cwa

Whereas,

TPA: Total population served by a primary health centre.

CWA: Composite weightages of a primary health centre.

Thus, result obtained are given in the following table

Table No. 2 Tribal Tehsil of Nashik District: Altitudinal belt-wise proportion of primary health centers according to average population served by per composite weightage, 2020-21,

Average Population, Served Per C. W.	300 to 400 M.		400 to 500 M.		500 to 600 M.		600 to 700 M.		Above 700 M.		Region	
	No. of PHC	%	No. of PHC	%	No. of PHC	%						
Less than 600	-	-	2	28.57	-	-	2	11.11	-	-	04	9.30
600 -1200	3	75	4	57.14	3	75	12	66.66	8	80	30	69.76
Above 1200	1	25	1	14.28	1	25	4	22.22	2	20	09	20.93
TOTAL	04	100	07	100	04	100	18	100	10	100	43	100

Source- Computed by Researcher, 2020-21

It goes without saying that the smaller the average population per weightage, the more efficient the health service center. The average population covered by per composite weightages at around 04 primary health centers (9.30) appears to be fewer than 600 people, according to table No. 2. About half of these 04 basic health centers are located in the 400-500 meter and 600–700-meter altitude belts. The average population serviced by per weightage ranges between 600 and 1200 in around 69.76 percent of primary health centers. About 40% of these primary health facilities provide health care services to 600 to 1200 people per weightage. These basic health centers are located in the 600–700-meter altitude range. In the four successive altitudinal belts, the remaining 18 primary health centers are more or less evenly dispersed. About 09 health service facilities had a population of over 1200 people per composite weightage. In the year 2020-21, health services are underserved in these service centers. (See figure no. 3)

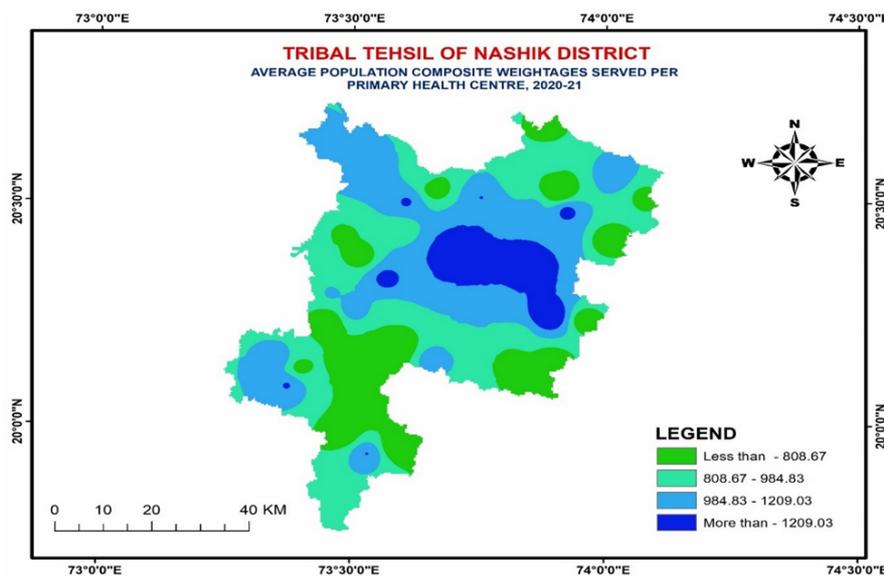


Fig. No. 3

VII. Conclusions

The study on the hierarchy of tribal health service centres and their average population per composite weightage offers significant insights into the spatial organization and efficiency of healthcare delivery in the tribal tehsils of Nashik district. The findings reveal a distinct hierarchical pattern, ranging from well-equipped rural and community health centres to underdeveloped primary health centres in remote tribal regions. The

graphical and composite weightage analysis identified four orders of health service centres, reflecting variations in accessibility, infrastructure, and service coverage across different altitudinal zones. The first- and second-order centres, such as Dindori RH, Surgana RH, Peint RH, Trimbak SDH, and Abhona RH, emerged as the most efficient units, supported by adequate infrastructure, trained personnel, and better connectivity. Third-order centres provide moderate services, while fourth-order centres, largely located in high-altitude and remote tribal areas, remain underserved due to infrastructural and accessibility constraints. Analysis based on the average population per composite weightage highlights clear disparities in service efficiency. Centres with smaller population coverage perform better, whereas those serving larger populations face resource limitations. Most centres fall within the moderate range, but some are heavily burdened, emphasizing the need for policy attention and resource redistribution.

VIII. Acknowledgment

Funding/ Grants/Financial Support: No, I did not receive

Conflicts of Interest/Competing Interests: No conflicts of interest to the best of our knowledge.

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