Original Research Article

Spatial Distribution of Health Centers: A Study of District Pulwama (Jammu and Kashmir)

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ABSTRACT

Background: Distribution of existing healthcare centers is an important aspect in healthcare and decision making. Based on GPS survey the spatial disparity of health centers were measures by applying Location quotient and Lorenz curve. Though the facilities are good enough to serve the population of the district, but while analyzing the spatial pattern of these facilities at medical block level, the results revealed that there is unequal distribution of both primary health centers as well as sub-centers. Therefore it is necessary to find out the nature of spatial conditions and the estimation of medical facilities needed for a given population. It is essential to conduct such study which will help the people as well as the planners to determine the medical needs which will in turn enhance the optimal utilization of resources.

Key Words: Health Centers, Population, Spatial Disparity, Distribution,

INTRODUCTION

Healthcare is defined as a program of services that makes available all facilities of health and allied services necessary to promote and maintain the health of mind and body. Healthcare in India is handicapped because it has to face serious crises in cost, quality of care and equitable distribution of modes and standards of service to the population as a whole. [1] Healthcare resources include practitioners such as physicians, nurses, health maintenance organizations etc. Spatial analysis is the geographical approach to understand inequalities in healthcare services. An important issue of equitable service distribution is the contrast between need for services and demand for them. [2] Access to healthcare requires that there is an adequate supply of health services available to a population. The availability of healthcare resources is measured traditionally using indicators such as the number of doctors or hospital beds per unit of population. The access should be distinguished between two components; initiation and continuation. [3] An important distinction exists between access to treatment and receipt of treatment. [4] Access depends on opportunities while receipt of treatment depends both on these opportunities and whether individuals have availed themselves of them. [5] The literature typically defines access to mean "Receipt of treatment". Access is therefore a complex concept and it is widely recognized in the literature that access is a function of more than just the time and money costs in seeking health service. It includes income, specifying services, quality, personal inconvenience, cost and information. [6]

Distribution of health facilities, population and transport facilities leads to the disparity in access to health centers. [7] The quality of health care in rural areas with predominantly low income and minority populations largely depend on geographical access and the distance to health care facility is highly sensitive in making health care choices. Geographical accessibility is defined as the ability of obtaining health care resources that meet the health demands of the population. It infers that a community has health care accessibility if the resources meet specific characteristics such as geographic location; affordability that fit with patients' needs. [8] The relationships between social disadvantages and availability of the quality and quantity of General Practice services, the geographical access to healthcare services were relatively equal across socioeconomic groups. However, the residents of deprived areas are facing difficulty in obtaining evening and same-day appointments. They conclude that services were available but more travel time and inadequate quality of services for some underprivileged populations. [9] For the assessment of supply, demand and spatial arrangement of health care centers the accessibility was measured based on euclidian distance and health facility – population ratio. The study was aimed to compute the ratio between population and health facilities to measure the spatial accessibility. The study revealed the disparities in health care system with very less percent of population availing the good health services. [10]

METHODOLOGY

The data for the analysis has been collected from Primary and secondary sources. The Secondary data with regard to number of public health centers like District Hospital, Community Health Centers, Primary Health Centers and Sub-Centers were collected from the District Health Office, Pulwama, Directorate of Health Service Kashmir Province and Department of Census Srinagar. The location of existing health centers was collected through GPS survey using Garmin etrex handheld GPS. Further, this collected information was integrated with ArcGIS 10.3 and the spatial data was prepared. Spatial Disparity of Health Centers at medical block level was measured by applying location quotient and Lorenz curve.

RESULTS
Healthcare Resources in District Pulwama

The present paper illustrates the availability of healthcare resources at medical block level in Pulwama District. In addition, the availability of healthcare resources, healthcare institutions, health workforce and health infrastructures are being discussed.

Pulwama District has 3 medical blocks (Pulwama, Pampore and Tral) and district headquarters is situated at Pulwama. The district encompasses 130 health centers, which includes 1 district hospital, 3 community health centers, 37 primary health centers and 89 sub-centers. The block wise distribution of health centers are mentioned in table1

Table 1: Public Healthcare Centers

Institutions	Name of the Medical Block			Total
	Pulwama	Tral	Pampore	
District Hospital	1	-	-	1
Community Health Centers	1	1	1	3
Primary Health Centers	17	08	12	37
Sub Centers FW	31	34	24	89

Source: District Health Office, Pulwama 2016

Spatial Disparity of Health Centers

Inequality in health services distribution has become a concern of challenge among different countries. [11] Equality in distribution of health services and equal accessibility to such services has become a major principle in most health systems. [12] Therefore, understanding the geographical distribution of health resources, equal accessibility to such resources and improvement of them may lead to better planning to make health services accessible to all.
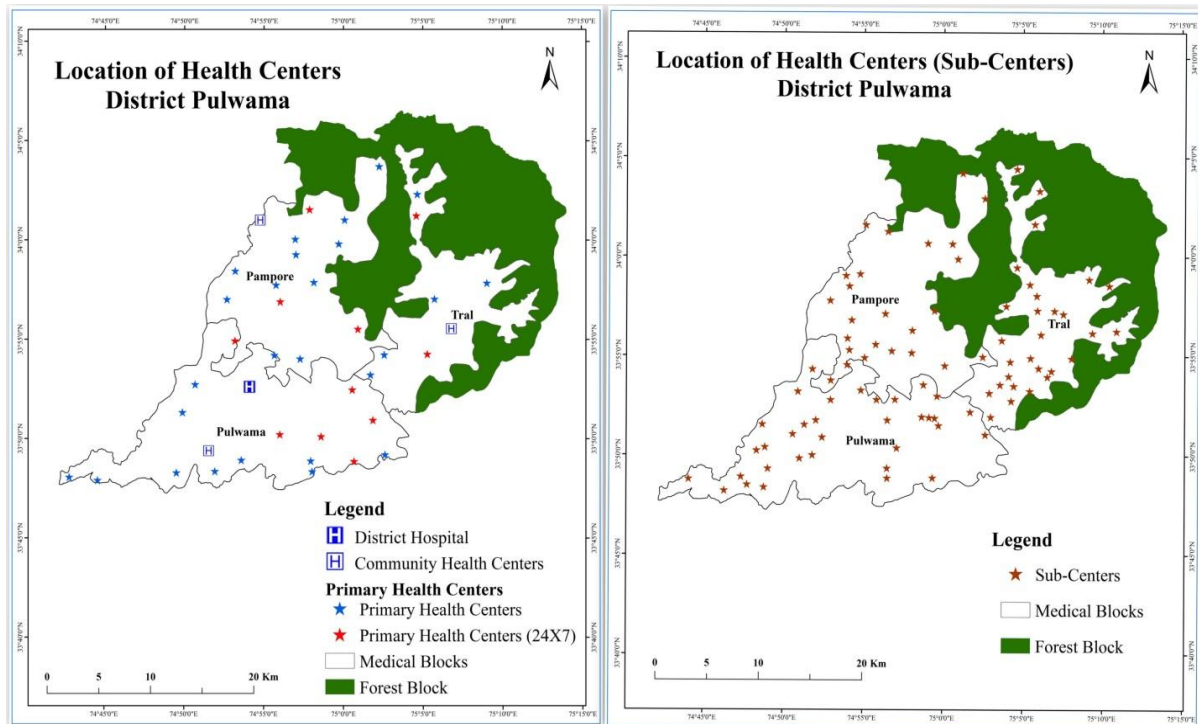
Map 1

The equal and fair distribution of resources in the health sector is one of the most important goals to be achieved by health systems in every country all over the world. It is usually considered to be one of the main challenges and concerns of policy makers and managers in the health sector. [13] To evaluate the distribution of healthcare resources such as health centers and health workforce with an emphasis on doctors, paramedical staffs, other supporting staffs and other infrastructure facilities in Pulwama District, Gini coefficient and Lorenz curve methods are being used. This will help to understand the nature of accessibility to health services and assist in reducing the inequality in the distribution of healthcare resources in Pulwama District.

Location quotient

Location quotient provides the spatial concentration pattern of amenities in a particular area. The location quotient is a method for comparing percentage share of a particular facility with its percentage share of population. This method is applied in order to show the variation in the concentration of health centers among medical blocks of the district. For calculating the location quotient (L.Q.) for health centers in a particular block the following formula has been used.

$$L.Q = \left(\frac{hv}{pv}\right) / \left(\frac{Hd}{Pd}\right)$$

Where:
L.Q= Location Quotient
hv= Number of health centers in particular block
pv= Population of the concerned block
Hd= Number of health centers in the district
Pd= Population of the district

If the value of the quotient for a particular facility in all block equals to 1, it indicates that the facilities are equally distributed. If the value of the quotient for a particular facility in a particular block exceeds 1, it means that the concentration exceeds the district average. A value lesser than 1 indicates a deficiency in the service, while a value equal to 1 or close to 1 indicates self-sufficiency. [14]

Location quotient of PHC

Table 2: Location Quotient of Primary Health Centers

Medical Block	Percentage of Population	Percentage of PHC	Location Quotient
Pulwama	41.93	45.94	1.09
Pampore	32.51	32.43	0.98
Tral	25.52	21.62	0.83
Total	100	100	

The table 4.2 depicts that the primary health centers varies at block level. The degree of location quotient of PHC's is higher in Pulwama block (1.09), which indicates more number of PHC's are available to its population. While as, in Pampore block the location quotient value is close to 1 (0.98) which indicates that the facilities are self-sufficient to the population of the block. In Tral block the value is less than 1 (0.83), which reveals that the facilities are deficit to the population. The location quotient of the medical blocks indicates that higher the value more facilities are available to the population and vice versa.

Location quotient of Sub-Centers

Table 3: Location Quotient of Sub Centers

Medical Block	Percentage of Population	Percentage of SC	Location Quotient
Pulwama	41.93	38.21	0.82
Pampore	32.51	26.96	0.82
Tral	25.52	34.83	1.5
Total	100	100	

The table 4.3 depicts that the sub-centers are also not equally distributed at block level. The location quotient value of SC's is higher in Tral block (1.5), which depicts more number of SC's available to its population, while in Pampore and Pulwama block the value is less than 1 (0.82), which discloses that the facilities are deficit to the population.

Lorenz curve

In order to have a clear idea about the index of spatial disparity with respect to Healthcare centers the special type of graph (Lorenz Curve) is commonly used for measuring inequality. The Lorenz curve compares the distribution of a given variable with the uniform distribution that represents equality. This uniform distribution is shown by a diagonal line. In this curve, horizontal axis (X) represents the cumulative percentage of Health Centre wise population and vertical axis (Y) illustrates the percentage of some values held by the corresponding cumulative proportion of the Health Centre. In our study, the X axis illustrates the cumulative percentage of population of District Pulwama and the Y axis shows the cumulative percentage of Health Centers in Pulwama District.

Using the Lorenz Curve an index of Inequality known as Gini's Coefficient has been calculated for Health centers. Gini's Coefficient are aggregate inequality measures and can vary anywhere from 0 (Perfect Equality) and 1 (Perfect Inequality). The Gini's Coefficient is calculated from the following formula.

$$G = \frac{1}{1000}\left[\sum xiyi + 1 - \left(\sum xi + 1yi\right)\right]$$

As per the norms of National Rural Health Mission (NRHM) the population norms for the provision of SC's, PHC's and CHC's are suggested 5000, 30000, and 120000 people respectively in plain areas, whereas in the Hilly/Tribal regions it is 3000, 20000 and 80000 respectively.

The available PHC's at block level are considered for assessing the nature of availability of health services as per the Health Policy norms of the Government of India. In Pulwama there are 37 PHC's, and it is estimated that on an average each PHC in the district is serving 15148 persons indicating better status in terms of ratio between the health centers and population served by each PHC. There is high concentration of PHC's in Pulwama block serving the population of 13826; hence there is lower population ratio than the district average. In Pampore and Tral blocks the number of PHC's are less in number serving the population at the ratio 1:13184 and 1:17902 respectively which is higher than the district average. This reveals that the PHC's in Tral block is under more pressure than other blocks. But when we compare the PHC population ratio in blocks with the NHM it is less than the prescribed norms. Hence the people in these blocks are having good healthcare facilities. The Gini's coefficient value of serving population of PHC's at block level is 0.052 which indicates that the healthcare centers are unequally distributed.
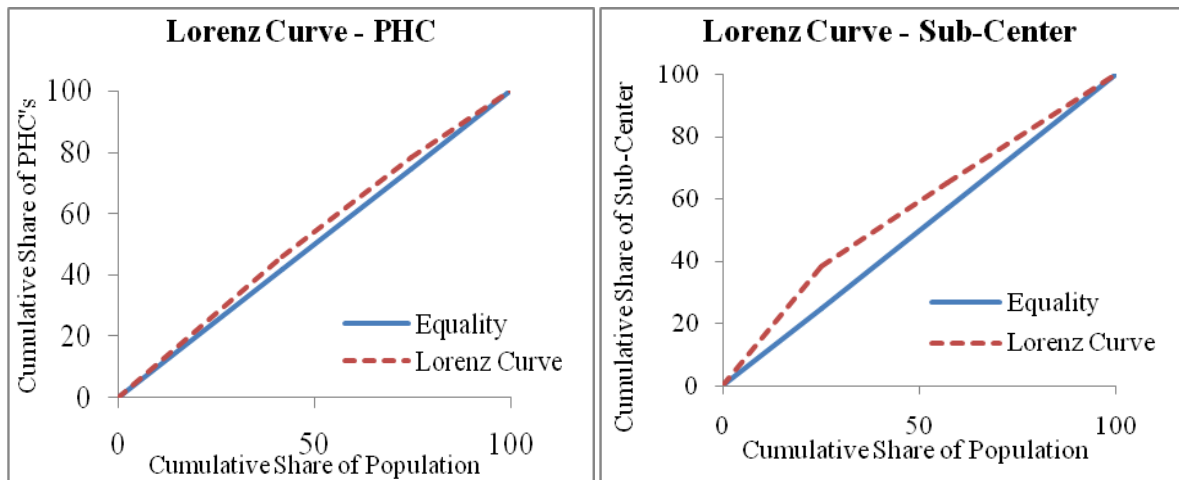
Fig 1

On an average each SC's in district is serving 6297 persons which indicate insufficient status of health facilities. However, the intra block inequality is also prevailing. The SC's of Pulwama and Pampore blocks are serving an average population of 7582 and 7592 persons respectively. In Tral the SC's are serving an average population of 4212 persons. The above fact has revealed that the SC's of Pulwama and Pampore blocks are facing acute population pressure which is above the population norms prescribed by NRHM. Similarly the Gini's coefficient value of SC's with the serving population at block level is also unequally distributed with the value of 1.26.

DISCUSSION

Though, the people of the district have good availability of health centers as a whole as the serving population ratio of CHC's and PHC's are according to NHM norms, while as in case of sub-centers the ratio is higher than the norm. Though the facilities are good enough to serve the population of the district, but the spatial pattern of these facilities at medical block level is unequal distribution of both primary health centers as well as sub-centers. In addition to the facilities, the availability of health workforce (Doctors, Paramedical staff and other supporting staff) and health infrastructure (Beds) are not sufficiently available to the population as per the norms.

Therefore it is necessary that the government should adopt population threshold as a yardstick for health care facility distribution as this is the only approach to ensure equity and social justice in distribution of health care and other basic facilities.

CONCLUSION

The study reveals that the health centers particularly PHC's and SC's are not equally distributed among the medical blocks of the district. The analysis of location quotient of PHC's in Pulwama block shows that there are excess of PHC's in proportion to the population size. While in Pampore block the facilities are in exact proportion to the demand of the population. Tral block the facilities are deficit compared to the population size of population. Similarly the analysis of location quotient of SC's in Tral block shows that there are excess of SC's in proportion to the population size. While in Pampore and Pulwama the facilities are deficit in relation to the population of blocks. The distribution of health centers indicates that the district possess a good number of PHC's as the health center population ratio is found within the NHM norm. The unequal distribution of health centers among the medical blocks reflects the variation in PHC population ratio norms and highest ratio is found in Tral block. Whereas the SC population ratio reflects the high population

pressure on such health centers than its prescribed norms, almost similar situation has been observed at block level also.

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