

The Distribution Pattern and Existing Disparities in Public Health Care Centres in Rudraprayag District of Uttarakhand, India

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ABSTRACT

Distribution pattern of existing health centre is an important aspect of health care delivery system. In mountainous region specifically in developing countries, it also influence the decision making process of individuals at times of need of such facilities. The present study aims to analyse the spatial distribution pattern and disparity of health care centres in Rudraprayag district of Uttarakhand by applying statistical techniques such as Location Quotient, Lorenz Curve and Gini Index. Though the health care facilities shows satisfactory situation in case of distribution pattern of public health care centres at district level, but while analysing these facilities at block level, the results reveals that there is significant inequality in the distribution pattern of both Primary Health Centres as well as Sub-Centres. The study is able to provide help to people and policy makers to estimate the health care facility needs and mark the areas facing comparatively high population pressure in terms of ratio of health centres to population.

Keywords: Spatial Disparity, Public Health Care Centres, Primary Health Centres, Sub-Centres, Inequalities

INTRODUCTION

Human health is an essential and integral part of a Nation's strength and prosperity. Provision for basic medical facilities has been one of the main objectives of all the developmental strategies. With the rapid increase in population as well as rising standard of living, it becomes a difficult task for every individual to achieve a better health. If health of individuals is to be improved, particularly in developing countries health care service system must be capable of delivering effective health care services and members of the society must use these services. [1]

Health care is a multitude of services available to individuals or community by the health professionals for promoting, restoring and maintaining health. Healthcare

delivery system refer to the totality of resources that a population or society distributes in the organization and delivery of health services. [2]

Health care system implies the organization of the people (i.e. doctors, nurses etc.), institution (hospitals, PHC, CHC etc.) and resources to deliver health care services to meet the health needs of target population. Healthcare in India is handicapped because it has to face serious crises in cost, quality of care and equitable distribution of mode and standards of service to the population as a whole. Spatial analysis approach in geography concerns itself with the variation in the localisation and distribution of a significant phenomenon or a group of phenomena over geographical space in order to understand the inequalities in it. An important issue of

equitable services distribution is the contrast between need for services and demand for them. [3]

Accessibility has now been introduced as another important variable in the way of health care service utilisation. Joseph & Phillips make the distinction between potential accessibility, which is influenced by the socio-economic and organisational features of a society and its health care system, and revealed accessibility, the actual utilisation of a service that is measurable in terms of frequency of attendance and even results. [4] They regard accessibility and utilisation as two sides of the same coin. [5]

In terms of utilisation of health services it appears that there are often interrelated complex variables influences the health care utilization pattern. The utilisation, like access, is influenced not only by the relative locations of facilities and potential patients, but by characteristics such as patients' age, sex, marital status, class, income and religion. [4], [6], [7]

These variables can constrain accessibility and often result in differential utilisation patterns. Access is therefore a complex concept and it is widely recognised in the literature that access is a function of more than just the time and money costs in seeking health services. It includes income, specifying health services, quality, personal inconvenience, cost and information. [8]

The quality of health care facilities in rural areas specifically those which are situated in hilly regions with predominately low income and sparsely populated villages often having minority population hugely depend on geographical access and distance plays a major role in making health care service choices. Distance and time are both important factors of accessibility. The World Health Organization recommends using travel time, rather than distance, to assess geographical accessibility. [9]

MATERIALS AND METHODS

Study Area

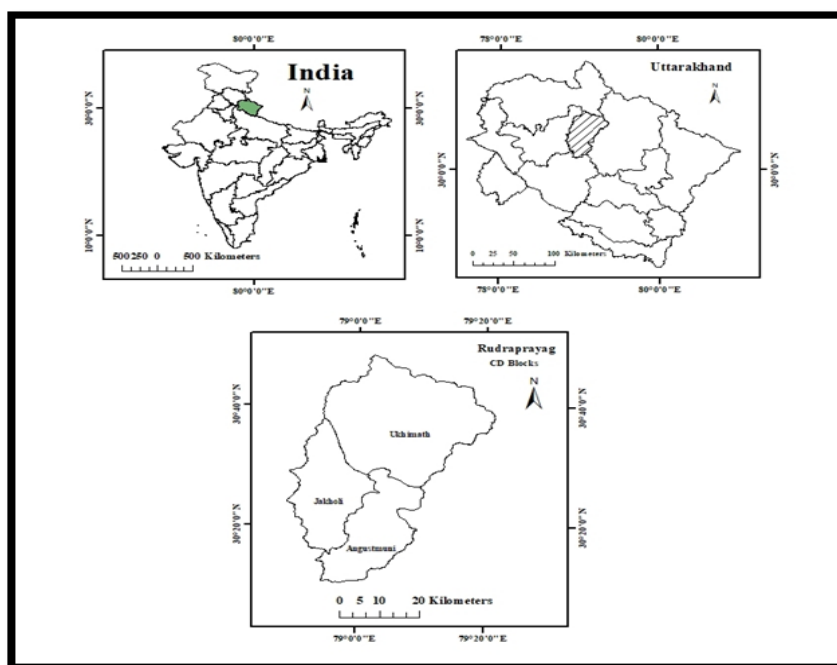


Fig. 1: Study Area in Map

Rudraprayag is a district of Uttarakhand state and the district headquarter is situated at the holy confluence of river Mandakini and

Alaknanda. It extend from $78^{\circ} 54'3''$ E to $80^{\circ} 2'3''$ E longitude and between $29^{\circ} 55'37''$ N to $31^{\circ} 27'3''$ N latitude, covering a geographical area of 2439 sq. km out of

which 484 sq. km is under forests. The district receives average rainfall of 1238 mm and the temperature ranges between 29°C in summers to -3°C in winters. The total population of the district is 2,42,285 as per 2011 census. More than 90% of population resides in rural areas whereas only 4.09% of the population lives in urban centres with a population density of 122 person per sq.km². The minimum height from the mean sea level is 670 meters at Rudraprayag city whereas maximum is 3886 m at Tungnath.

Objectives

To measure spatial distribution pattern of Health Care Services at block level.

To access the spatial disparity of Health Centres at block level in the district.

Database

The present study has entirely been based on secondary data. The secondary data regarding number of public health centres such as District Hospital, Community Health Centres and Primary Health Centres etc. were collected from District Medical Office Rudraprayag; Uttarakhand Health and Family Welfare Society; Department of Medical Health and Family Welfare. Data about the population of the district has been gathered from District Census Handbook 2011. [10]

The location of existing health centres was collected from CMO Office. To access the Spatial Disparity of Health Centres at Medical Block Level the Location Quotient and Lorenz Curve were applied. Then Gini Coefficient was calculated to measure the inequality index of health centres.

Statistical Analysis

Spatial Inequality of Health Centres

Health for all is the notion behind the concept of PHC as declared by the Alma Ata Conference in 1978.

In the conference the primary health care defined as “an essential health care made universally accessible to individuals

and acceptable to them, through their full participation and at a cost the community and country can afford.” It infers that equality of health services can be achieved through equal accessibility, availability, affordability and acceptability these four are not just an important but integral part of health care delivery system. [11]

Many studies suggest that large inequity in resources and services can intensify disparities in health outcomes and quality of life. [12]

Inequality in health service distribution poses a major challenge towards policy makers and people of the country. Equality in distribution of health services and equal accessibility to such services has become a major principle in most health systems. [13]

Therefore understanding of the geographical distribution and accessibility of health services may help to construct better planning or improvement of existing ones to make the notion of health for all true in its every aspect.

In order to understand the nature of distribution of health resources in the study area the statistical tools of Lorenz curve and Gini Index have been used. Both these method are able to provide the insight of nature of accessibility of health services and lead to reducing the inequality in the distribution of healthcare services in the district.

Location Quotient

Location quotient is tool used to determine the spatial distribution pattern of any given phenomenon in a specific area compare to an entire region. In order to understand the spatial clustering of the health resources at block level the comparison of percentage share of healthcare services in each block with its percentage share of population has been calculated using the Location quotient formula. The concentration of health services at each medical block level is compared to the spatial concentration pattern of the health services in district

level. The formula used for calculating the LQ for health centres of specific block is as follow:

$$L. Q. = \frac{hv}{pv} / \frac{Hd}{Pd}$$

Where:

L.Q. = Location Quotient

hv = Number of health centres in particular block

pv = Population of the particular block

Hd = Number of health centres 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 specifies that the service or facility in all blocks equally distributed. If the value of the quotient for a specific service exceeds 1, it indicates that the concentration of the particular service exceeds from the district average whereas a value lesser than 1 means a deficiency in the service and a value close to 1 specifies self-sufficiency. [14]

Lorenz Curve and Inequality Index

Lorenz curve is a graphical method of studying dispersion or measuring degree of inequality. It is a cumulative percentage curve which compares the distribution of a given variable with the uniform or equal distribution. This equal distribution is represented by a diagonal line which is known as line of equity. In the present study the graphical representation of spatial disparity of health centres is computed by Lorenz Curve. The X axis of this graph represents the cumulative percentage of population of the district and the Y axis illustrates the cumulative percentage of health centres in the district.

In order to have in depth idea about the spatial disparity of health centres an inequality index based on Lorenz curve has been calculated known as Gini Index. It reflects the ratio of the area between the Lorenz curve and the diagonal line of equity (45°), to the whole area below the equity line. The values of Gini Index vary from 0 to 1. The value of 0 indicates perfectly

equitable distribution of facilities or resources; a value less than 0.3 means preferred equity status, if the value is greater than 0.4 it indicates an alarming situation of inequality and if the value exceeds from 0.6 it reflects a high inequality in the distribution of facilities or resources (Theodorakis et al 2006). The Gini Index is calculated using the formula below:

$$G = \frac{1}{10000} \left[\sum X_i Y_{i+1} - \left(\sum X_{i+1} Y_i \right) \right]$$

Where:

G = Gini Index

Y_i = cumulative proportion of health services

X_i = cumulative proportion population

RESULTS

The present study elucidates the availability of healthcare services at block level in Rudraprayag District. The District has three blocks: Augustmuni, Jakholi and Ukhimath. The district headquarter is Rudraprayag situated in Augustmuni. The district comprises 84 health centres which includes 1 District Hospital 2 Community Health Centres (CHC), 16 Primary Health Centres (PHC) and 65 Sub-Centres (Table 1)

Table:1 Numbers of Public Health Centres in the District Rudraprayag

Institution	Name of Block			Total
	Augustmuni	Jakholi	Ukhimath	
District Hospital	1	-	-	1
Community Health Centres	1	1	-	2
Primary Health Centres	8	4	4	16
Sub-Centres	32	23	10	65
Total	42	28	14	84

Source: CMO, Rudraprayag

Location Quotient of PHC in Blocks of District Rudraprayag

The table 2 describes that the LQ of Primary health centres varies at block level in the district. The higher value of LQ is found in Augustmuni block (1.32) which means that this block has higher concentration of PHC's to its population. The Jakholi block has lowest percentage share of population in the district but with a

LQ value close to 1 (0.96), indicating self-sufficiency in the primary health care facilities. The Ukhimath block with a population percentage of 35.92 has a LQ less than 1(0.70) facing insufficiency of primary health care services.

Table 2. Location Quotient of Primary Health Centres at Block level in District Rudraprayag

Block	Percentage of Population	Percentage of PHC	Location Quotient (LQ)
Augustmuni	37.91	50	1.32
Jakholi	26.17	25	0.96
Ukhimath	35.92	25	0.70
Total	100.00	100.00	

Source: Compiled by Authors

Location Quotient of Sub-Centres Blocks of District Rudraprayag

The LQ of Sub-Centres of medical blocks is presented in table:3. It reveals that

the sub-centres are not equally distributed in the district. On the one hand the Augustmuni and Jakholi blocks with a LQ of 1.30 and 1.35 have higher clustering of sub-centres whereas the Ukhimath block which is situated comparatively in the higher altitude has very low concentration of Sub-Centres with a LQ of 0.43. It reveals that the people of Ukhimath block are facing a huge deficiency in availability of health care facilities.

Table 3. Location Quotient of Sub-Centres at Block level in District Rudraprayag

Block	Percentage of Population	Percentage of SC	Location Quotient
Augustmuni	37.91	49.23	1.30
Jakholi	26.17	35.38	1.35
Ukhimath	35.92	15.38	0.43
Total	100.00	100.00	

Source: Compiled by Authors

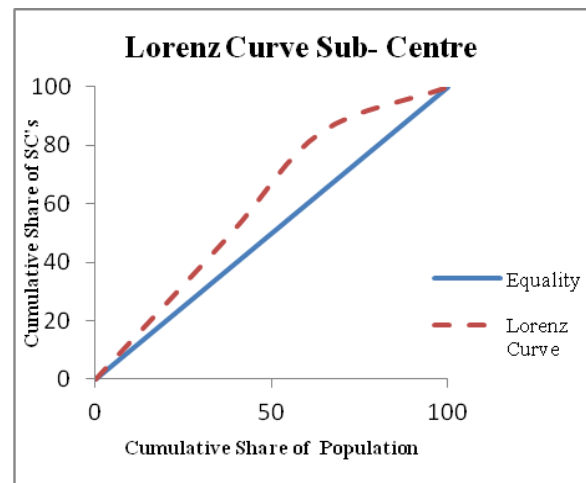
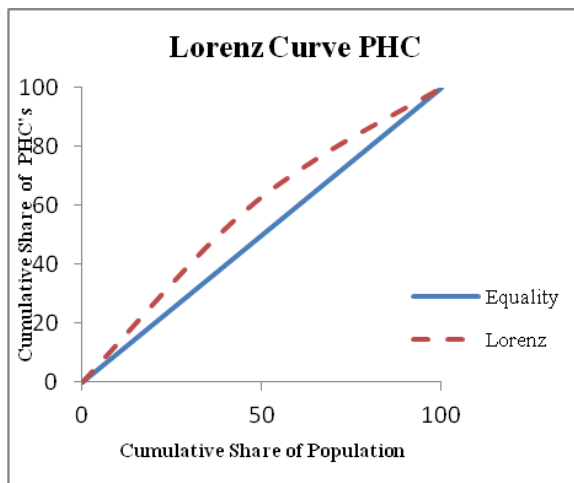


Fig.2

The population provisions for CHC's, PHC's and SC's as suggested by the National Rural Health Mission (NRHM) are 120000, 30000 and 5000 respectively in the plain areas whereas in the Hilly/Tribal region it is 80000, 20000 and 3000 respectively. The ratio between Health centres and population is low in hilly and tribal areas because of rugged terrain which causes difficulties in accessibility and population in these regions also distributed in small and dispersed settlements patches over the selected suitable sites.

The numbers of health centres and the population it serves can help us to evaluate the availability of health services as

per the National Health Policy of the country. The Rudraprayag district has a total of 16 primary health centres with the total population of 242285, hence each PHC is serving approximately 15143 people which reflect a fairly better condition in terms of ratio between PHC and population served. The total number of PHC's in Rudraprayag block is 8 which is 50 percent of total PHC's available in the district, therefore with a high clustering of primary health centres in this block each PHC is serving approximately 11482 people. In Jakholi and Ukhimath block the ratio of PHC and population are 1: 15851 and 1: 21756 respectively. It infers that the PHC's of

Ukhimath block are under more pressure than the other blocks. On the one hand the district average of PHC's is presenting a better status while on the other hand the block level conditions are deviate from the prescribed norms. The Gini Index value of serving population of PHC's at block level is 0.145 which indicates a relatively good equality in the spatial distribution pattern.

The total number of SC's serving the people of the Rudraprayag district is 65 which mean that on an average each SC is serving approximately 3727 people reflecting SC's are having more population pressure than PHC's. The SC's of Rudraprayag and Jakholi serving with a ratio of 1:2871 and 1:2757 while the SC's of Ukhimath are facing serious population pressure as on an average each SC of Ukhimath block is serving to 8702 people which is more than two times higher than the prescribed population norms given by NRHM. The Gini Index of SC's is 0.20 of the district which indicates that the overall distribution pattern of SC's in all block level is tending to equality but it does shows more inequality compare to PHC in the district.

DISCUSSION AND CONCLUSION

The study reveals that on an average the people of Rudraprayag district are having a good availability of health facilities as the ratio between health centres and population it has to serve is above the average norms suggested by NHRM. The Primary Health Centres in all three blocks of the district is serving a satisfactory numbers of people which is in accordance with the norms of National Health Policy. However of all three blocks the Ukhimath block is under more pressure in this regard. While in case of Sub-Centres again the Ukhimath block is projecting immense population pressure as the ratio of each SC to serving population is more than two times higher than the guidelines define by the National Health Policy. In order to improve health facilities in the concerned blocks the present study suggests that the number of health care centres and accessibility of the

same should be given higher priority by the policy makers and concerned authority. The clustering pattern of the health care centres also reflects higher concentration in comparatively low altitude areas of the district as a result the higher reaches of the district is undergoing high population pressure.

ACKNOWLEDGEMENT

The research reported in this paper was supported by a grant from the Indian Council of Social Science Research (ICSSR), New Delhi.

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- How to cite this article: Agarwal A, Singh S, Rawat MSS. The distribution pattern and existing disparities in public health care centres in Rudraprayag District of Uttarakhand, India. *Int J Health Sci Res.* 2021; 11(1):100-106.
