DISPARITIES OF HEALTH INFRASTRUCTURE DEVELOPMENT IN RURAL AREAS OF MURSHIDABAD DISTRICT, WEST BENGAL, INDIA: A GEOGRAPHICAL ANALYSIS

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Introduction

Health infrastructure development is of utmost importance for improving the quality and accessibility of healthcare services (Nurkaeva, et. al., 2022, Ansu, et. al., 2022, Ntuli, et. al., 2020, and Dibyendu, et., at., 2017). It plays an important role in achieving Universal Health Coverage (UHC) and promoting public health (Karen, et., al., 2019). Health infrastructure development in India and in the states has been a focus area for both government and non-government agencies in recent years. There has been significant progress in improving health-related indicators and initiatives have been taken to enhance the quality of healthcare services (Abhineet, 2023). The expansion of healthcare sector and the rise of digital technologies have led to the adoption of e-health processes and infrastructure, including electronic health records, telemedicine, and AI (Goyal, et., al., 2022). However, the distribution of health infrastructure facilities is uneven across the country, with certain states like Bihar, Jharkhand, Madhya Pradesh, and Uttar Pradesh lacking in basic healthcare facilities (Kiran, 2020). The current healthcare infrastructure in India is poor and requires fundamental reforms to address emerging challenges (Baljeet, 2020). There is a need for increased government spending and better financing mechanisms, such as insurance schemes, to ensure the optimal utilisation of healthcare benefits (Anshul, et., al., 2022).

In India, and in states like West Bengal, the availability of healthcare facilities directly impacts major health outcomes, such as life expectancy and infant mortality rate. However, there are challenges in terms of resource allocation and manpower, especially in densely populated areas like Bihar and West Bengal. Public-private partnerships have been recognised as a viable approach to enhance healthcare infrastructure and bridge the gap in investment. Sustainable financing mechanisms, such as the proposed Public Health Infrastructure Fund, are essential to ensure long-term support for core public health

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capabilities. Overall, health infrastructural development is vital for improving healthcare services, promoting public health, and achieving equitable access to quality healthcare.

Health Infrastructure Development is crucial for achieving healthcare goals, such as Universal Health Coverage (UHC), and plays a significant role in improving health outcomes, ensuring equitable access to quality healthcare services, and responding effectively to public health challenges. The level of health infrastructural development varies across regions and countries, and addressing disparities is a key focus of healthcare planning and policy initiatives. In this background, this study aims to focus on regional disparities in health infrastructure development at the block level in Murshidabad district, West Bengal.

Objectives of the study

Following objectives have been considered in this study.

To assess the extent of health infrastructure development in rural areas throughout the district based on secondary data.

To examine the disparities in the development of health infrastructure in rural areas within selected sample blocks using primary data.

Data Source and Methodology

Data collection and analysis are important components of any research endeavour. The source of data and the methodology adopted to fulfil the objectives mentioned above are explained below.

Data Source

For the comprehensive evaluation of health infrastructure development in rural areas across the district, both secondary and primary data are used, secondary data are obtained from Census of India and District Statistical Handbook, West Bengal (2001 and 2011). On the other hand, primary data have been collected through field survey in 2019. This will involve surveys, interviews, and direct observations to gather first hand information about the existing health facilities, their conditions, and the accessibility of health care services in rural settings.The data are collected from 1,040 sample households across 44 sample villages situated within 6 blocks. From each of these sample blocks, ten percent (10 percent) of villages were purposively chosen, considering factors such as accessibility via transportation, proximity to local markets, and population size. Subsequently, a purposive sample of five percent of households are selected from each sample village for data collection.Total 1,040 sample households (Table1) are finalised out of the 1,286,200 rural households in the district (District Census Handbook, 2011).

Table 1: Details of sample blocks, villages and households, 2019

Name of the sample block	No. of sample village	No. of sample household (n=1040)
Burwan	16	398
Berhampore	12	292
Beldanga-I	6	144
Raninagar-II	3	75
Raghunathganj-II	4	57
Samserganj	3	74

The selection of sample households involved the application of a stratified random sampling method. To assess the health infrastructure development, 3 variables are chosen by using both secondary and primary data (X_1, X_2 and X_3) (Table 2).

Table 2: Selected variables of health infrastructure development

Variable	Description of variable	Data source
X_1	No. of healthcare centres per thousand of population	District Statistical Handbook, WB, 2001 and 2011, Field Survey, 2019
X_2	Doctors in healthcare centres per thousand of population	District Statistical Handbook, WB, 2001 and 2011, Field Survey, 2019
X_3	Village nutrition centres per thousand of population	District Statistical Handbook, WB, 2001 and 2011, Field Survey, 2019

Methodology

For measuring the levels of health infrastructure development in the study area, the Composite Z Score has been used. Firstly, standard score or Z score iscalculated for each variable with the help of given formula:

$$Zij = \frac{\mathrm{Xij} \quad \overline{\mathrm{X}}\mathrm{i}}{\sigma_i}$$

Where, Zij= Z score of variable *i* in block *j*

Xij= Actual value of variable *i* in block *j*

$\overline{\mathrm{X}}$i= Mean value of variable *i* in all blocks

σ_i= Standard deviation of variable *i* in all blocks

After the calculation of Z Score for each variable, Composite Z score (CZ) have been calculated for each variable. The CZ Score has been standardised. The positive values in respect to the block's Z score show high level of health infrastructure development and negative values the low level of health infrastructure development in the study area. It can be written as follow:

$$cZij = \frac{\sum Zij}{N}$$

Where,cZij = Composite Z score

$\sum$ Zij = Z Score of all variables in selected groups

N = number of variables in selected group

For thematic representation of data, Arc-GIS software has been used. Level of health infrastructure development is divided into three classes based on composite Z score value with + 1 SD i.e. more than + 1 represents high developed class, - 1 to + 1 represents moderate and less than - 1 represents low developed class for three selected years, 2001, 2011 and 2019.

Study Area

Murshidabad district is situated at the central position of West Bengal, occupying the northernmost section of the Presidency division. Geographically, it extends from 23°43'30" to 24°50'20" north latitudes and 87°49'0" to 88°46'0" east longitudes (Fig. 1). This district comprises 26 community development blocks, 7 municipalities, and 2167 villages, and characterised by its diverse landscape. As per 2011 census data, the district has a total population of approximately 7,103,807. The majority (80.22 percent) reside in the country side, while the rest (19.78 percent) are in urban areas. This demographic distribution underscores the predominantly rural nature of Murshidabad, emphasising the significance of addressing health infrastructure development disparities in the context of its diverse and widespread population.

Results and Discussion

Disparities of health infrastructure development

Regional disparity refers to the unequal distribution or variation of resources, opportunities, development, or outcomes across different regions within a country or geographical area. These disparities can manifest in various aspects, such as economic development, infrastructure, education, healthcare, and standards of living. Among them, health infrastructure is one of the basic needs of people to alive. It includes a wide range of components that collectively support the provision of medical care, preventive services, and health-related interventions to a population.Expenditures on health are considered an investment in human resources, contributing to productive capacity. On the other hand, the contribution of health to per capita economic growth is largely anecdotal (Grosse and Harkavy, 1980). Health centre per capita, hospital beds, and physicians per capita serve as inputs in the health sector, while decreases in morbidity, mortality, and increases in life

expectancy are the outputs of investment in the health sector. To measure the level of health infrastructure development, three variables have been considered in the present study (Table 2).

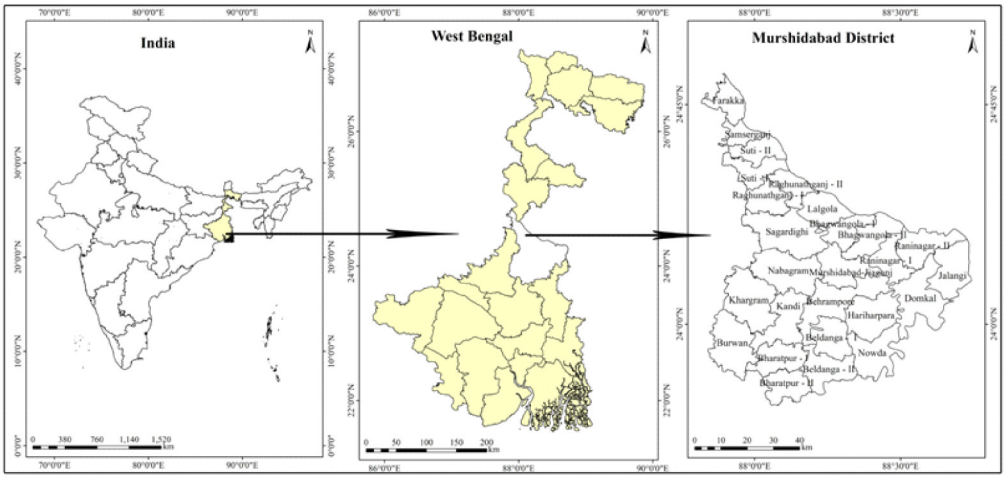

Fig. 1: Location Map of the Study Area

High level of health infrastructure development

In 2001, six blocks like, Suti-I, Raghunathganj-II, Burwan, Bharatpur-I, Bharatpur-II, and Nowda fell under this level, but by 2011, only three blocks (Nabagram, Sagardighi, and Burwan) remained in this grade. Throughout this period, Burwan was the sole block consistently categorised as such, while Nabagram and Sagardighi transitioned from the moderate health infrastructural development category in 2001 to the high health infrastructure development category in 2011 (Fig.2). The number of healthcare centres, health workers, and village nutrition centres (X_1, X_2, and X_3) revealed a considerable increase in Nabagram and Sagardighi blocks from 2001 to 2011. A subsequent field survey data of 2019 identified Samserganj block as highly developed in terms of health infrastructure in the study area. Remarkably, this block experienced a rapid increase in the number of healthcare centres and health workers (X_1 and X_2), outstanding the health infrastructure development observed in other sampled blocks (Fig.2).

Moderate level of health infrastructure development

In 2001, 17 blocks (65% of total blocks) were recognisedas moderate health infrastructure developmentblocks in the study area, a number that increased to twenty (77% of total blocks) in 2011. Thirteen blocks consistently maintained this level from 2001 to 2011, including Farakka, Raghunathganj-II, Lalgola, Bhagawangola-I, Bhagawangola-II, Raninagar-I, Murshidabad-Jiaganj, Khargram, Berhampore, Domkal, Kandi, Beldanga-I,

and Beldanga-II (Fig.2). However, certain blocks exhibited a shift in this level. Suti-I and Raghunathganj-I blocks saw no improvement in the number of health care centres and village nutrition centres (X_1 and X_3), while Bharatpur-I and Bharatpur-II blocks experienced no improvement in the number of health workers and village nutrition centres (X_2 and X_3). Consequently, these blocks transitioned from the high level of health infrastructure development in 2001 to the moderate level in 2011 (Fig.2). Evidently, Suti-II recorded an upsurge in the count of health workers (X_2), Hariharpara saw enhancements in both the number of healthcare centres and health workers (X_1 and X_2), and Samserganj witnessed growth in health centres, health workers, and village nutrition centres compared to other blocks with lower health infrastructure development in 2001.As a consequence, these three blocks progressed to a moderate level of health infrastructure development in 2011(Fig.2).

Further analysis based on a sample survey in 2019 acknowledged,Raghunathganj-II, Berhampore, Beldanga-I, and Burwan blocks in the moderate level of health infrastructure development in the study area. While,Raghunathganj-II, Berhampore, and Beldanga-I maintained their level, Burwan shifted to this class due to health care centres operating without health workers (X_2) and low number of village nutrition centres (X_3), indicating a decline from a high level (Fig.2).

Low level of health infrastructure development

In 2001, Samserganj, Suti-II, and Hariharpara blocks were categorised as having moderate level of health infrastructure development in the district (Fig.2). However, by 2011, these three blocks had regressed to the moderate level of health infrastructure development. In the same year, three additional blocks, namely, Raninagar-II, Jalangi, and Nowda, were also identified in this category.

Raninagar-II confronted a decline in health infrastructure development, specifically in number of health workers and village nutrition centres (X_2 and X_3), compared to other moderately health infrastructure development blocks in 2001. Consequently, Raninagar-II shifted to a low level of health infrastructure development in 2011. Nowda and Jalangi blocks, on the other hand, did not perform as well in increasing the number of healthcare centres, health workers, and village nutrition centres (X_1, X_2, and X_3) compared to other blocks with high and moderate health infrastructure development from 2001 to 2011. As a result, these two blocks were classified under low health infrastructure development in 2011 (Fig.2).

Problems related to health infrastructure in the study area

Rural areas are often deprived due to lack of sufficient number of healthcare professionals, limited hospital presence, and a shortage of beds and medical clinics. Following problems related to health infrastructure development are identified through field survey in the study area.

Unavailable ambulance services: Ambulance services for patients face significant challenges in Burwan, Beldanga-I, and Raninagar-II blocks. High rental costs, unavailability of ambulances, long distances, and poor road connectivity are the primary issues affecting this service.

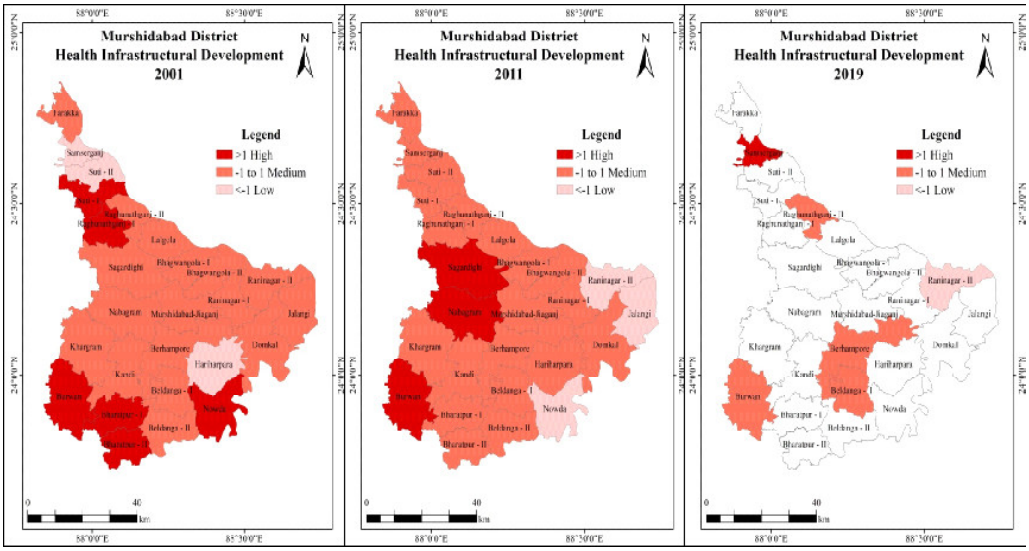

Fig.2: Levels of Health Infrastructure Development in Murshidabad District in 2001, 2011 and 2019

Lack of health worker / doctors: Village doctor and Ayurveda, practitioner and government appointed ASHA and NNM are the main health worker in villages of Burwan, Raninagar-II, Beldanga-I. But most of them remain unskilled and they are not well trained till now. In the village area number of doctors in rural health centre is very low.

Insufficient bed capacity relative to the size of population: Hospital infrastructure of rural Murshidabad is not very good. In the study area, bed capacity is very low according to the size of population of every block.

Recommendations for health infrastructure development in the study area

The population in rural areas generally get less access of healthcare centre and practitioners than their urban counterparts. Diagnostic facilities, ambulance services, free

medicine, health care centre and health workers are needed to improve the situation in the study area. These recommendations should be adapted based on the specific needs and challenges identified in the study area through field visit in 2019, to achieve sustainable health infrastructure development.

1. Ambulance services

Ambulance services play a crucial role in providing emergency medical assistance during critical moments, aiding rural residents in reaching the hospital promptly. In the study area, there is a pressing need to enhance the ambulance service in rural areas. This involves addressing factors such as reducing the cost of ambulance services, increasing the availability of ambulances, and ensuring they are well-equipped to meet the medical needs of patients during transit.

2. Skilled health worker

In rural areas, skilled health workers play a significant role in health services, despite the appointment of trained health workers such as ASHA and ANM. In Burwan, Beldanga-I, and Raninagar-II blocks, there is a need to increase the number of such trained health workers.

3. Rural doctor

In the study area, a village doctor practices modern (allopathic) medicine without formal registration, approval, or legal sanction. Additionally, Ayurveda practitioners and local priests are present in the community. To enhance the skills and knowledge of Ayurveda health workers in Burwan, Raninagar-II, and Raghunathganj-II blocks, there is a need for improvement through government training centres.

4. Rural hospital

As per government regulations, a community health centre is mandated to provide essential facilities such as an operation theatre, a labour room, X-ray machine, pathological lab, etc. It is recommended that the government ensures the availability of comprehensive treatment options and diagnostic tests in rural hospitals to cater to the healthcare needs of villagers

5. Increase bed capacity in Health centres

The community health centre currently facilitates 30 beds for indoor patients. Private hospitals have been established in the Samserganj block. To address healthcare needs effectively, it is recommended that the government increases the number of beds in rural hospitals in Berhampore, Burwan, Beldanga-I, Raninagar-II, and Raghunathganj-II blocks.

6. Availability of free medicine

Under the National Health Mission (NHM), free drug services and free diagnostic services for all were initiated on 2nd July 2015.While certain general and generic medicines are partially available in rural areas through the free drug service, there is a constraint in the availability of diagnostic tests. In case of free diagnostic service no diagnostic test is available at sub-centre (SC) and primary health centre (PHC) and a few numbers of test are available at community health centre (CHC) in Raninagar-II, Burwan, Beldanga-I and Raghunathganj-II block, it is recommended that the government ensures strict adherence to providing these essential services uniformly across all blocks in the Murshidabad district.

Conclusion

The provided evidence offers a comprehensive overview of the status of health infrastructure development in rural areas of the study area. The following are the key conclusion of the present work:

The present study highlights the dynamic trends in health infrastructure development in the study area, revealing that Burwan, Nabagram, Sagardighi, and Beldanga-I blocks exhibit positive trends, while Bharatpur-I and II, Raghunathganj-I, and Raninagar-II experience negative changes. Blocks with developed health infrastructure show higher proportions of health centres and village nutrition centres, while those with lower health infrastructure development face shortages of health workers and village nutrition centres. To uplift these blocks, focused efforts on job creation, increased agricultural production, skills development, and improved health facilities are imperative. The findings further highlight the importance of ongoing monitoring and interventions to address disparities in health infrastructure development.Blocks experiencing declines or stagnation may require targeted efforts to improve health infrastructure and ensure equitable access to healthcare services.

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