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SPATIAL ANALYSIS OF RURAL HEALTH STATUS IN BARDHAMAN DISTRICT OF WEST BENGAL: A GEOGRAPHICAL PERSPECTIVE

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Abstract

This paper presents a study on the spatial dynamics of the rural health condition in Bardhaman district, West Bengal on four Community Development (CD) Blocks-Kalna I, Katwa II, Galsi II and Raina I. The paper follows a qualitative-descriptive and spatial-analytical approach to the study and uses the secondary data available and field observations using the firsthand direct observation and GIS-based mapping of the selected 110 pre-selected strategic observation points of habitation cluster and the health infrastructure facilities in rural areas. Main parameters that were considered are distance to health facilities, the condition of infrastructures, accessibility to maternal and child health services and quality of sanitation. This provides strong spatial differences in the analysis: the majority of settlements fall in a radius of 1-3 km around health centres, but 11.8% are found further than 5 km of the centres. No more than 41.8% of health infrastructure is functioning with full capacity and routine maternal and child healthcare services are palatable in less than 50% of the places. There is also a negligible sanitation infrastructure with only 30% of places having the appropriate toilet and drainage mechanism.

Keywords: Rural health, Spatial analysis, Bardhaman district, Health infrastructure, Maternal and child health services.

1. INTRODUCTION

The rural health is considered a flagship of national development in India as almost 65% of the citizens still live in the rural areas. In the state of West Bengal where there is tremendous diversity in demography, agro-climatic conditions and infrastructural imbalances, the significance of rural health takes an even bigger role. The problem of a fair access to health facilities in such environment cannot be reduced only to the implementation of associated

policies, but it is crucial to fix spatial disparities that affect the scope and efficiency of the state health systems.

Even though there are state-sponsored healthcare initiatives like National Rural Health Mission (NRHM), Janani Suraksha Yojana (JSY) and Swachh Bharat Abhiyan (SBA) going on, there is disparity in the equal distribution and access of rural healthcare. The unfulfilled maternal and child delivery, lack of proper sanitation facilities, low supply of well-trained health workers, and declining health status of the rural health centres remain a problem to successful health intervention.

With its disparate geography; the alluvial and fertile plains on the eastern side and the lateritic tracts towards the west; its different levels of rural development: rural development in Bardhaman district, spreads across the differences between rural and urban, constitutes a micro microcosmic vision of the overall rural health situation in the country. The health delivery system in the district is fragmented at various Community Development (CD) Block level as each CD Block has its own set of unique problems with regards to the physical infrastructure, provisions of healthcare, and environmental health hazards.

2. LITERATURE REVIEW

Banerjee et al. (2022) conceptualized, performed a detailed metric-based study of the urban development in Bardhaman Municipality in the district of Purba Bardhaman. Based on spatial techniques, as well as morphometric, their research examined not only dynamics in urban shapes ratings over time that respond to the demographic stress but also to infrastructural development. Though their study aimed more at revitalization of urban areas, their findings emphasized the role of spatial structuring, distribution of infrastructures, population density which is also imperative in the case of rural health accessibility.

Banu and Biswas (2022) further investigated this question by employing a spatial-geographical perspective on the influence of international border proximity on the accessibility to healthcare in West Bengal. In their study, they found that the regions close to borders were often afflicted with weak healthcare facilities and less and less providers because of administrative negligence, bad transport access and casualization. Even though they focused their study in border regions, they delve into an analysis of medical inequality, which can be rather well implemented in the analysis of internal district-level differences. Their work emphasized the effects of geographical remoteness, infrastructural isolation and uneven state

attention, which can lead to substantial consequences on the healthcare quality- all of which apply to the rural interior blocks of Bardhaman as well.

Ghosh and Mistri (2020) carried out a GIS-based analysis within the Birbhum district but it has specifically studied the issue of spatial inequality of health infrastructure within the rural set up. By using spatial modeling and accessibility mapping techniques, they were able to illustrate the differences in health service distributions in terms of different terrains, settlement patterns, and the presence of transportation. Their study highlighted the vital importance of spatial data as part of the planning process of effective rural health strategies which also informed the procedure followed in the current study to a large extent. Their results yielded cross references to experiences to Bardhaman in lighting up the shadows common to both as far as disparity in health facility distribution and poor connectivity in some blocks is concerned.

Ghosh et al. (2023) looked at the temporal and spatial variability of the Air Quality Index (AQI) in West Bengal between the years 2016 and 2021. Although the study was interested in measuring the parameters of environmental conditions, its methodological usage of spatial-temporal mapping, visualization of data, and regional depiction demonstrated the flexibility of spatial methods when it comes to determining the conditions of the public health-related state of affairs. As portrayed in their paper, the environmental hazards linked to improper air quality were similar to sanitation and hygiene issues faced in rural Bardhaman.

3. METHODOLOGY

The present novel study uses a spatial-geographical method to understand the state of health in the rural setting of Bardhaman district, West Bengal. It focuses more on observational and secondary spatial data thus not following tradition surveys rather utilizes visual records, government records, and infrastructural mapping.

3.1 Research Design

The study will be quantitative-descriptive and spatial-analytical because the objective will entail the determination of geographically rooted patterns in the case of rural health infrastructure, accessibility, and environmental health outcomes on the basis of direct fieldwork and secondary data. The research was conducted in four purposively sampled Community Development (CD) Blocks of Bardhaman district viz. Kalna I, Katwa II, Galsi II and Raina I. These blocks have been selected on the basis that they reflect the heterogeneity of the agro-climatic zones (varying between alluvial soils and lateritic soils) in the district, the differences

in the road and transport connectivity, and the differences in demographic and infrastructural nature of the blocks.

3.2 Analytical Techniques

The research whose main focus was on rural health condensed mainly on the spatial record keeping and secondaries data analysis. The GIS tools were used to geolocate the health facilities namely Sub-Centres (SCs), Primary Health Centres (PHCs), and the condition of these health facilities was thereafter confirmed by making visual checks on these places. Observational variables were the physical proximity of clusters of habitation to the health facility closest to them, the structural and functional soundness of infrastructure (including building standards, signage, and electricity), access to maternal and child health services (based on the existence and timings of Auxiliary Nurse Midwives).

The field conditions determined predefined categories in which all recorded observations were placed, e.g., in the category of fully functional, partially functional, or poor. The last stage was the tabulation of various data as in frequency tables and percentages table so that one can carry out a comparison of spatial variation of the 110 observations that were made.

3.3 Sample Size

The study consisted of 110 observation points that were documented at a spatial level. Every single point of observation was identified as belonging to one of the following categories:

- A cluster of 10-15 households in a rural habitation setting, sampled on the basis of their relative spatial access to the public health infrastructure, and the visual appearance of health-related conditions.
- A place, which is a Sub-Centre (SC) or Primary Health Centre (PHC) and where functionality, maintenance status, and practice in service delivery observed visually.

These points were not sampled at random but were selected purposefully to be sure of infrastructural geographic diversity in the chosen CD blocks.

4. RESULT AND DISCUSSION

This section has a spatial description of the rural health situation of four different Community Development (CD) Blocks of Bardhaman district such as Kalna I, Katwa II, Galsi II and Raina I. The researchers have used 110 observation points that were strategically selected to capture the important variables associated with the level of healthcare accessibility, infrastructure functionality, maternal-child services delivery, and sanitation condition.

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4.1 Proximity of Rural Settlements to Health Facilities

The table below depicts the distribution of the 110 observation points by indicating its proximity to a nearest health facility which is either a Sub-Centre (SC) or a Primary Health Centre (PHC). The classification is useful in evaluating the infrastructural viability of healthcare in terms of physical accessibility to the chosen rural blocks of Bardhaman district.

Table 1: Distribution of Observation Points by Distance from Nearest Health Facility (in km)

Distance Range (km)	Frequency	Percentage (%)
0–1 km	30	27.3%
1–3 km	42	38.2%
3–5 km	25	22.7%
>5 km	13	11.8%
Total	**110**	**100%**

As evidenced by the table, the greatest aspect of concentrations on the observation points (38.2%) is situated at 1 to 3 km away, to a health facility relative to highly accessible services. Less than one quarter of the sites though are located in 0-1km with only 27.3% of the city areas. The next figure is the graphical one that shows a distribution of the 110 points that were observed in terms of the percentage by the range of distance they had to the nearest health facility. It resembles the information presented in Table 1, with the possibility to have accessibility levels to compare visually at a faster pace.

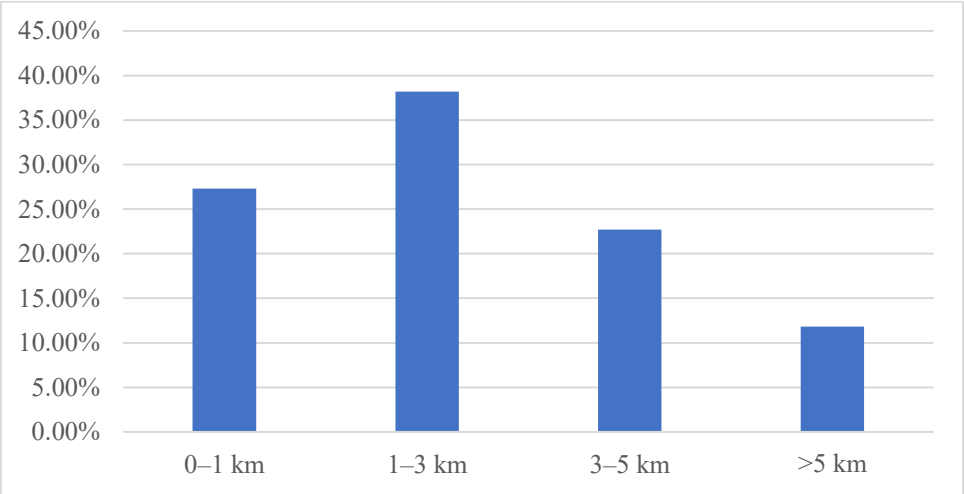

Figure 1: Graphical Representation of the Percentage of Observation Points by Distance from Nearest Health Facility (in km)

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The figure reiterates the fact that rural dwellings, have been concentrated in the 1 3 km range which is denoted by the tallest bar. It is also evident that it graphically highlights the greater percentage of points with convenient access (0 to 1 km) and the total amount that is subject to great distance obstacles (>5 km). This just shows the imbalance of healthcare accessibility based on geography in rural Bardhaman.

4.2 Functional Status of Rural Health Infrastructure

In the below given tabular form, it is as seen the status of the rural health infrastructure status in the 110 sites visited in the CD blocks chosen in Bardhaman district. Every building, whether a Sub-Centre (SC) or Primary Health Centre (PHC) was visually evaluated and placed in any one of three categories, independent variable, i.e., fully functional, partially functional, and poor/neglected, based on infrastructure condition, electricity, staffing, and maintenance.

Table 2: Condition of Rural Health Infrastructure Observed

Condition	Frequency	Percentage (%)
Fully functional	46	41.8%
Partially functional	38	34.5%
Poor/Neglected	26	23.6%
Total	**110**	**100%**

Table shows that 41.8% of the health facilities that were only partially functional show that there is a fairly healthy infrastructure in various locations. Nonetheless, only 34.5% of the facilities are fully operational and many of them lack equipment, personnel or upkeep; with 23.6% in the poor or neglected category which suggests a large disparagement in preparedness and safety of services.

The figure below shows a visualization of the percentage distribution of the condition of the infrastructure in health facilities in the rural areas among the 110 points made observation.

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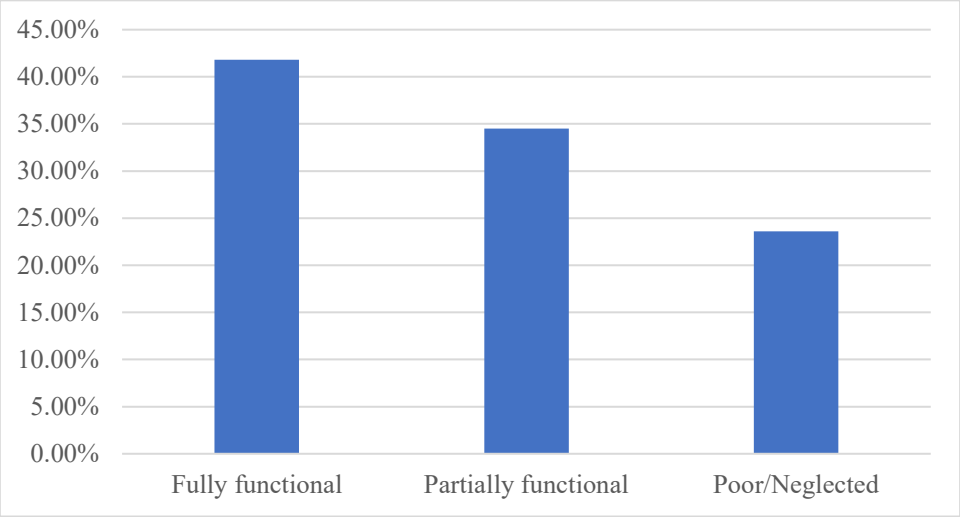

Figure 2: Graphical Representation of the Percentage of Condition of Rural Health Infrastructure Observed

The figure shows a distinct prevalence of fully functional facilities with an enormous percentage of partially functional units taking second place. On the one hand, the chart is encouraging, and on the other, the poor infrastructure (23.6% of networks) gets underlined due to the visual representation.

4.3 Availability of Maternal and Child Health Services

Availability of maternal and child health services may be found in the table below that represents the 110 points of observations in the study region. The sites were grouped as having a regular availability of service, intermittent visits in areas where ANMs were present, and the non-service provision areas based on the visible accounts of records, schedules, and the ANMs presence in these areas.

Table 3: Availability of Maternal and Child Health Services at Observed Points

Service Availability	**Frequency**	**Percentage (%)**
Regular (weekly visits/ANMs present)	49	44.5%
Irregular	35	31.8%
Not Available	26	23.6%
Total	**110**	**100%**

As shown in the table, the availability of maternal and child health services is regular only in 44.5% of the places observed. More than one third (31.8%) of such services are received on non-regular basis, and a quarter of them (23.6%) is not available at all.

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Below is the graphical representation of the percentage amount of availability of service in terms of maternal and child health at the sites that were observed. The analysis gives prominence to the percentage area coverage of regular, irregular, and none at all coverage of locations and augments the tabular data.

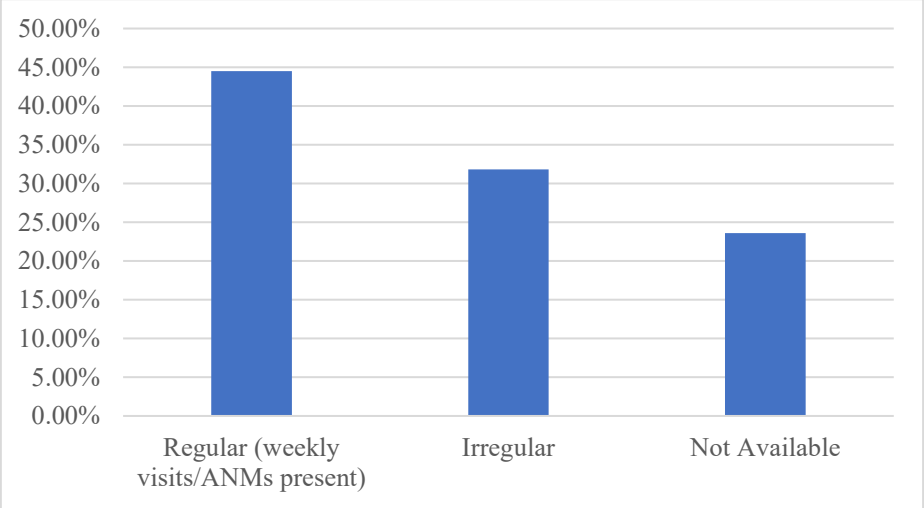

Figure 3: Graphical Representation of the Percentage of Availability of Maternal and Child Health Services at Observed Points

The figure graphically explains that a major part of the observation points receives regular maternal and child health services but the corresponding part of the observation is that regular services are irregular and absent in many points. The highly visible decrease in the number of the bars in which you could see the difference between the “Regular” and “Not Available” varieties indicates the disparate process of outreach against maternal health in the rural area of Bardhaman, where more effective field-level management and workforce are needed.

4.4 Sanitation and Hygiene Conditions in Observed Areas

The next table classifies the sanitation and hygienic status found in 110 rural sites in Bardhaman district. The divisions are made according to the sight of infrastructure e.g. household toilets, availability and condition of drainage systems, and sight of sanitation practices e.g. open defecation.

Table 4: Sanitation and Hygiene Conditions Noted

Sanitation Status	Frequency	Percentage (%)
Proper sanitation (toilets, drainage)	33	30.0%
Partial (basic toilet but poor drainage)	48	43.6%

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Poor (open defecation, no drains)	29	26.4%
Total	**110**	**100%**

The table shows that there was availability of proper sanitation services within 30% of the rural observation points that included functional toilets and drainages. Most of them, constituting 43.6% of the total, had partial systems with simple toilets, however poor to well-chocked drainage. The shocking part is that 26.4% of sites are using open defecation and lack drainage facilities which means there were still Budgap in the hygiene infrastructure even with the sanitation campaigns.

Percentage distributions of the sanitation and hygiene status of 110 observed sites situated in rural areas are indicated in the figure below. It classifies the areas as having proper, partial and poor sanitation using observable signs on the environment and availability of basic facilities.

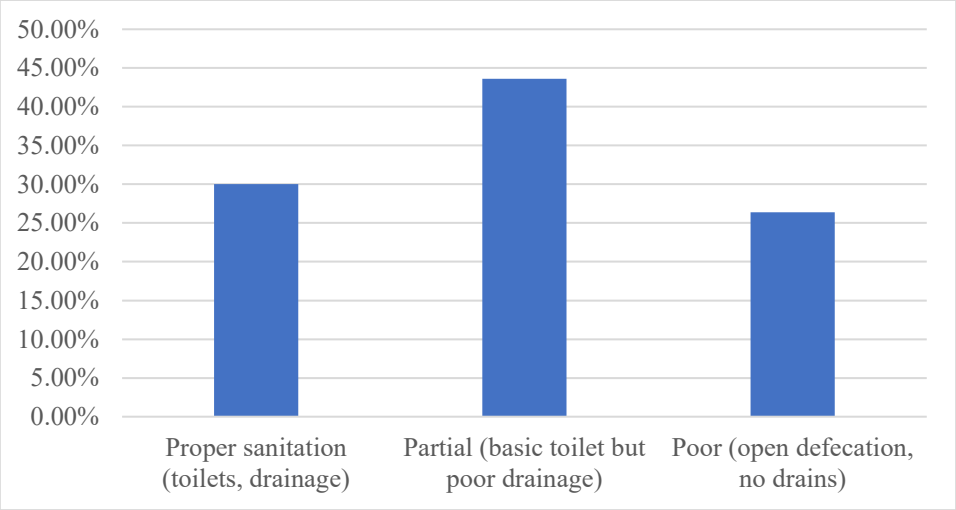

Figure 4: Graphical Representation of the Percentage of Sanitation and Hygiene Conditions Noted

This figure shows clearly that there is a greater likelihood of partial sanitation infrastructures rather than people who are yet to have simple hygiene setups. The shortage of infrastructures providing proper sanitation in the rural areas of Bardhaman can be physically emphasized on by specifying that only a relatively low percentage of rural Bardhaman areas has proper facilities of sanitation (30%). This disproportionate spatial distribution of hygienic services is a serious threat to the population health and is a symptom of the necessity to consider rural sanitation in an integrated way through planning and monitoring the activities.

5. CONCLUSION

Spatial information on the health of the rural people in Bardhaman district indicates that rural health is characterized by a blatant disparity in the access and lack of health infrastructures among the identified Community Development Blocks. Even though a great number of settlements are relatively close to health centres, a substantial percentage of rural areas population continue to stay beyond 5 km of health care facility thus a serious problem to access to health care in a timely manner. More than half of health facilities are poorly maintained or functioning partially due to weaknesses in the systems in infrastructure and service delivery. Maternal and child healthcare, which is an important health indicator, was found to be sporadic or completely missing in some of the places indicating the gap in staffing and implementing it at the field level. This is a strong indication that there has to be a geographical based planning and investment in the health facility infrastructure of the country in the rural areas, the health facilities outreach and sanitation.

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