*International Journal of Pharmaceutical and Medical Research*
*Volume – 11 Issue – 1 January-June 2023*
*Website: www.woarjournals.org/IJPMR* *ISSN: 2348-0262*

# Spatial Epidemiology of Malnutrition Among Children in Tribal Regions of Southern Rajasthan: A Medical Geographical Analysis

**Dr. Snehlata [1], Dr. Mukesh Kumar Sharma [2], Dr. Babita [3]**

[1] Assistant Professor, Department of Geography, Maharani Girls PG College, Rampura, Alsisar, Jhunjhunu, Rajasthan

[2] Principal, Maharani Girls PG College, Rampura, Alsisar, Jhunjhunu, Rajasthan

[3] Assistant Professor, Department of Geography, Maharani Girls PG College, Rampura, Alsisar, Jhunjhunu, Rajasthan

**Abstract:** ***Malnutrition continues to be one of the most persistent public health challenges in India, especially among tribal communities. Southern Rajasthan—including Udaipur, Dungarpur, Banswara, Pratapgarh, and parts of Sirohi—hosts one of the largest tribal populations in the country. These areas exhibit high levels of stunting, wasting, and underweight prevalence in children under five years. This study applies medical geography and spatial epidemiology to examine the distribution, determinants, and pattern of malnutrition among tribal children. Using primary field surveys (540 households), Anganwadi records, NFHS-4 (2015–16) datasets, the research identifies clusters of severe malnutrition and correlates them with environmental and socio-economic factors such as food insecurity, poor maternal health, water scarcity, low literacy, and inadequate healthcare accessibility. The spatial analysis reveals that wasting is highest in Dungarpur (29%), stunting is most severe in Banswara (41%), and underweight prevalence peaks in southwestern Udaipur (38%). The study concludes that malnutrition in tribal Rajasthan is a multi-dimensional problem shaped by environmental constraints, cultural practices, and settlement isolation. It proposes geographically-targeted interventions including nutrition gardens, mobile health units, tribal women's SHGs, and community-based monitoring of child growth.***

**Keywords: Malnutrition; Spatial Epidemiology; Tribal Health; Medical Geography; Rajasthan; GIS; Stunting; Wasting; Underweight; Nutrition..**

## 1.1 Introduction

Malnutrition represents both a medical and geographical problem, deeply rooted in socio-environmental realities. Rajasthan's tribal belt—dominated by Bhil, Meena, Garasia, and Kathodi communities—faces some of the worst child nutrition indicators in India. The unique geographic challenges of Southern Rajasthan such as hilly terrain, scattered settlement patterns, water scarcity, low agricultural productivity, and limited healthcare access reinforce the cycle of malnutrition.

According to NFHS-4 (2015–16), over 44% of children in Southern Rajasthan suffer from chronic malnutrition. The persistence of malnutrition in tribal regions indicates structural inequalities, environmental constraints, inadequate maternal care, and socio-cultural factors that require a spatial and medical-geographical lens.

This research examines the pattern of malnutrition not only as a biological condition but also as a spatial phenomenon influenced by physical geography, food systems, local ecology, and healthcare accessibility.

## 1.2 Objectives

1. To assess the prevalence of malnutrition (stunting, wasting, underweight) among tribal children in Southern Rajasthan.

2. To analyze the spatial distribution and clustering of malnutrition-affected regions using GIS.

3. To examine socio-economic, environmental, and cultural determinants of malnutrition.

4. To compare district-wise variations in child nutrition.

5. To propose geographically tailored solutions for reducing malnutrition in tribal regions.

## 1.3 Methodology

**I. Study Design**

Descriptive and analytical research rooted in medical geography and spatial epidemiology.

**II. Data Sources**

Primary Survey:

1. 540 tribal households across 18 villages (Udaipur–8, Dungarpur–4, Banswara–4, Pratapgarh–2)

2. Height, weight, MUAC of 720 children

3. Structured interview schedule

**III.Secondary Data:**

1. NFHS-3 (2005–06) and NFHS-4 (2015–16)

2. Aanganwadi (ICDS) child growth registers

3. Census 2011

4. Tribal Welfare Department reports

5. Rajasthan Health Department records (before 2018)

**IV. Malnutrition Indicators**

1. Stunting (Height-for-Age)

2. Wasting (Weight-for-Height)

3. Underweight (Weight-for-Age)

4. WHO Child Growth Standards used for categorization.

**V. GIS Techniques**

1. Geo-tagging of surveyed villages

2. Hotspot analysis using Getis-Ord Gi*

3. Interpolation for spatial distribution

4. Accessibility modeling (villages vs. PHC/CHC)

## 1.4 Study Area

**1. Udaipur District**

Hilly terrain, scattered settlements, tribal majority villages (Jhadol, Kotra, Gogunda).

**2. Dungarpur**

Dense tribal population, low literacy, high wasting levels.

**3. Banswara**

Significant stunting and chronic poverty.

**4. Pratapgarh**

Undulating land, drought-prone pockets, low agricultural diversity.

**5. Sirohi (partly included)**

Tribal clusters in Abu Road block, forest–hill interface.

Southern Rajasthan has a largely rural and forested landscape with traditional agriculture dependent on monsoon and manual labor.

## 1.5 Observations

**I. Malnutrition Indicators (Primary Survey Findings)**

| District | Stunting (%) | Wasting (%) | Underweight (%) |
|---|---|---|---|
| Udaipur | 38 | 25 | 33 |
| Dungarpur | 36 | 29 | 31 |
| Banswara | 41 | 24 | 37 |
| Pratapgarh | 33 | 22 | 28 |

**II. Determinants Identified**

1. Low dietary diversity (dominance of maize + chutney meals)

2. Water scarcity leading to diarrheal episodes

3. Poor maternal nutrition during pregnancy

4. Frequent migration for labor → child care disruption

5. Early marriage and adolescent pregnancies

6. Inadequate sanitation

7. High prevalence of anemia among mothers

8. Low literacy of mothers (average 22–30%)

**III. Health Infrastructure Accessibility**

1. Distance to nearest PHC often exceeds 6–10 km

2. Only 26% villages have functional Aanganwadi growth monitoring

3. No ambulance access in interior hilly settlements

**IV. Cultural Practices**

1. Feeding of watery millet porridge (thin gruel) to infants

2. Delayed initiation of complementary feeding

3. Sharing of meals between adults and children during food shortages

4. Traditional beliefs against certain foods for pregnant women

## 1.6 Discussion

**I. Spatial Dynamics of Malnutrition**

Three major hotspot clusters:

1. Southwestern Udaipur (Jhadol–Kotra belt)

2. Northern Dungarpur (Aspur region)

3. Central Banswara (Bagidora–Ghatol region)

These hotspots overlap with:

1. Remote hilly terrain

2. Poor connectivity

3. High marginalization

4. Limited agricultural productivity

**II. Environmental Factors**

Tribal regions rely on monsoon-fed agriculture with very low irrigation (<18%). Drought years significantly worsen malnutrition indicators. Soil fertility is moderate to low, with limited diversity of crops beyond maize, gram, and some pulses.

**III. Maternal and Child Health**

Early pregnancy, anemia, and poor antenatal care strongly correlate with stunting. The study finds children of illiterate mothers have 19% higher risk of being underweight.

**IV. Economic Vulnerability**

Seasonal migration to Gujarat and nearby districts disrupts child feeding practices. Wage laborers often leave children in the care of elderly grandparents, affecting feeding frequency.

**V. Cultural Resistance**

Some tribal groups resist packaged nutritional supplements (e.g., THR) due to taste, mistrust of government supply, or cultural preference for homemade foods.

## 1.7 Results

**1. District-Level Variation**

1. Stunting highest in Banswara (41%)

2. Wasting highest in Dungarpur (29%)

3. Underweight highest in Udaipur (33–38%)

**2. Spatial Hotspots**

Three statistically significant clusters identified using Gi* analysis.

**3. Determinants**

Environmental, socio-cultural, and economic factors produce a multi-dimensional etiology of malnutrition.

**4. Health Access**

Villages more than 5 km from PHC/CHC have 25–35% higher malnutrition prevalence.

## 1.8 Conclusion

Malnutrition in Southern Rajasthan's tribal regions is a complex medical-geographical phenomenon shaped by environmental constraints, nutrition insecurity, cultural practices, and healthcare inaccessibility. Spatial epidemiological analysis reveals distinct hotspots that must be prioritized for targeted interventions. Addressing malnutrition requires integration of local ecology, traditional food systems, women-centric development, and geographic accessibility planning.

## 1.9 Recommendations

1. Village Nutrition Gardens supported by Aanganwadi workers.

2. Mobile Health and Nutrition Units for remote tribal hamlets.

3. Mother Support Groups and Tribal SHGs for nutritional education.

4. Strengthening ICDS: regular supply of THR, better growth monitoring.

5. Geographically targeted programs for hotspot villages.

6. Local crop diversification (millets, pulses, vegetables).

7. Community-based management of acute malnutrition (CMAM).

8. Rainwater harvesting and improved drinking water sources.

9. Nutrition counseling for pregnant and lactating women.

10. GIS-based monitoring system for malnutrition prevalence.

## References


[1.]Banerjee, A., and Duflo, E. (2011). Poor Economics. Penguin Books.

[2.]Government of Rajasthan. (2014). Rajasthan Tribal Development Report. Tribal Welfare Department.

[3.]International Institute for Population Sciences (IIPS) and ICF. (2017). NFHS-4: National Family Health Survey (2015–16).

[4.]Nair, M. K., Augustine, L. F., and Konapur, A. (2016). Food and nutrition security challenges in India. Clinical Epidemiology and Global Health, 4(1), 1–10.

[5.]Ruel, M., and Alderman, H. (2013). Nutrition-sensitive interventions. Lancet, 382, 536–551.

[6.] Sharma M.K. et.al. (2011). Chikitsa eyam Sawasthay Bhoogol, Sahityagar, Jaipur

[7.] Sharma M.K. et.al. (2012). Disease Ecology. M. D. Publication, Jaipur

[8.] Sharma M.K. et.al. (2012). Chikitsa Bhoogol. M. D. Publication, Jaipur

[9.] Sharma M.K. et.al. (2022). Geography of Hot Waves. Woar Journals

[10.] Sharma M.K. et.al. (2022). Disease Ecology in Hindi. Woar Journals

[11.] Sharma M.K. et.al. (2022). Communicable Disease Ecology in Hindi. Woar Journals

[12.] Sharma M.K.(2011) Distribution of Geo- Pathologic Region of Malaria Disease in Rajasthan in Hindi, Journal - Water and Land Use Management, Volume-(3), Issue- 1-2 (Jan. –Feb. 2011), 0975-704X, p.21-36.

[13.] Sharma M.K.(2014) Geo-medical contribution of Dominant Air Born Communicable diseases in Ajmer District, Rajasthan, Journal -Sanchayka, Volume-(7), Issue-1(Jan.- Mar. 2014) , 2231-3001, p.35-41.

[14.] Sharma M.K.(2019) Heat Stroke (Loo)- A Geoenvironmental Crisis in Rajasthan, Journal -Parisheelan, Vol.-(15), Issue- 2, April-June.2019, 0974- 7222, p.390-396

[15.] Sharma M.K.(2019) Malaria-A Geo-environmental Crisis in Shekhawati Region, Rajasthan, Journal -Universal Review Journal, Volume-(10), Issue- 1, Jan-Jun...2019, 2277-2723, p.431-438.

[16.]World Health Organization. (2011). Guidelines for Drinking-Water Quality (4th ed.). WHO Press.

[17.]UNICEF. (2013). Improving Child Nutrition: The Achievable Imperative for Global Progress.

[18.]World Health Organization. (2006). WHO Child Growth Standards.