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Spatial dimensions of women's nutritional health and Anaemia in Chhattisgarh and Jharkhand: A secondary data analysis based on NFHS-5

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Abstract
Nutritional health among women and children remains a major public health concern in India, particularly in socio-economically vulnerable and tribal-dominated regions. The present study analyses the spatial distribution of women's nutritional status and anaemia prevalence among women and children in Chhattisgarh and Jharkhand using district-level secondary data from the National Family Health Survey (NFHS-5), 2019–2021. The study examines five major indicators: prevalence of low Body Mass Index (BMI <18.5 kg/m²) among women, prevalence of overweight and obesity (BMI ≥25 kg/m²), anaemia among children aged 6–59 months, anaemia among non-pregnant women aged 15–49 years, and total anaemia among women aged 15–49 years. The study identifies significant regional disparities across districts and highlights the coexistence of undernutrition, anaemia, and emerging obesity, reflecting the double burden of malnutrition. The findings reveal that central and northern districts of Chhattisgarh and northern Jharkhand demonstrate higher prevalence of undernutrition and anaemia, while urban-industrial districts increasingly exhibit overweight and obesity. In contrast, several tribal southern districts display comparatively better nutritional outcomes in selected indicators, possibly linked with traditional lifestyles and food systems. The paper argues that nutritional conditions are shaped by broader socio-economic, cultural, geographical, and developmental processes. The study emphasizes the need for geographically differentiated nutritional policies and region-specific interventions that integrate women's health, dietary diversity, healthcare accessibility, and local food systems.

Keywords: Nutritional Transition, Anaemia, Women's Health, BMI, NFHS-5, Chhattisgarh, Jharkhand, Spatial Analysis, Malnutrition

Introduction

Nutrition is one of the most fundamental determinants of human health, wellbeing, and productivity. Nutritional status among women and children reflects not only food intake but also broader socio-economic, cultural, environmental, and healthcare conditions. In developing countries, particularly in South Asia, malnutrition and anaemia continue to remain major public health concerns despite significant improvements in food production and welfare programmes. According to the World Health Organization (WHO), undernutrition, micronutrient deficiency, overweight, and obesity are among the most important contributors to disease burden globally (WHO, 2020) [7].

India presents a highly complex nutritional landscape characterized by the coexistence of undernutrition and overnutrition. This phenomenon, often described as the "double burden of malnutrition," is increasingly visible across several Indian states where chronic energy deficiency, anaemia, and stunting coexist alongside rising overweight and obesity (Popkin *et al*, 2020) [7]. Women constitute one of the most nutritionally vulnerable population groups because their health is closely linked with reproductive burden, dietary inequality, maternal care, healthcare accessibility, and socio-cultural practices.

Anaemia continues to remain a widespread micronutrient deficiency in India, particularly among women and children. Anaemia adversely affects maternal health, child growth, cognitive development, immunity, and productivity (Bentley & Griffiths, 2003) [1]. According to NFHS-5, the prevalence of anaemia among women and children remains alarmingly high across many Indian states despite policy interventions such as Poshan Abhiyaan, Anaemia Mukt Bharat, Integrated Child Development Services (ICDS), and iron-folic acid supplementation programmes.

Chhattisgarh and Jharkhand provide an important regional context for examining nutritional disparities because both states are characterized by significant tribal populations, forest-dependent livelihoods, uneven regional development, poverty, and infrastructural inequalities. Simultaneously, urbanization and industrial growth in selected districts have contributed to changing dietary patterns and emerging obesity trends. Thus, both states represent an important example of nutritional transition where undernutrition and overnutrition coexist spatially.

The present study analyses district-level nutritional indicators in Chhattisgarh and Jharkhand using NFHS-5 (2019–2021) data. The paper focuses on women's nutritional status, overweight and obesity, and anaemia prevalence among women and children. The study adopts a geographical perspective and seeks to understand nutritional outcomes as socio-spatial phenomena shaped by regional inequality, livelihood systems, accessibility, and socio-cultural conditions.

The major objectives of the study are:

- To analyse the spatial distribution of women's nutritional status in Chhattisgarh and Jharkhand.
- To examine district-level variation in low BMI, overweight, and obesity among women.

- To access the spatial pattern of anaemia prevalence among women aged 15 49 years and children aged 6–59 months.

Database and Methodology

The present study is based on secondary data obtained from the National Family Health Survey (NFHS-5), 2019–2021 [5, 8]. District-level nutritional indicators for Chhattisgarh and Jharkhand were analysed.

The following indicators were included:

- Prevalence of low BMI (BMI <18.5 kg/m²) among women
- Prevalence of overweight and obesity (BMI ≥25 kg/m²) among women
- Percentage of anaemic children aged 6–59 months
- Percentage of anaemic non-pregnant women aged 15–49 years
- Percentage of anaemic women aged 15–49 years

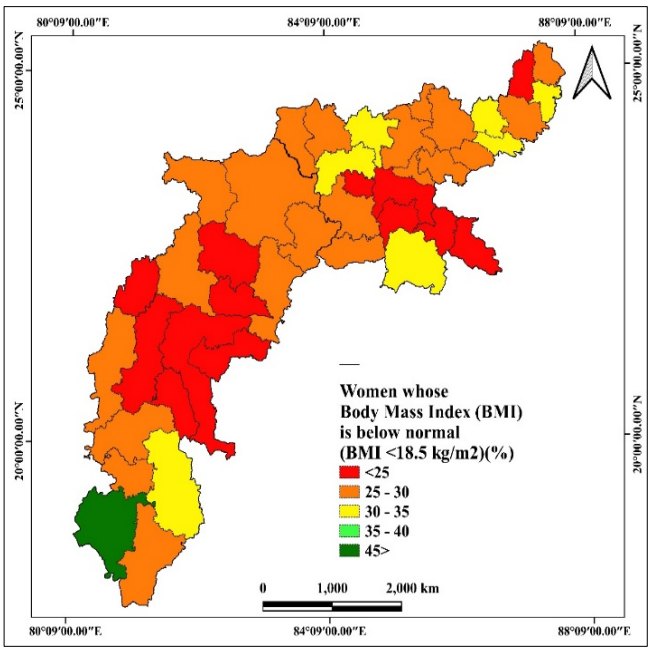
The study adopts descriptive and spatial analytical approaches. District-wise categorization and regional comparison were used to interpret nutritional disparities across the two states. The findings are discussed within broader socio-economic and geographical contexts including tribal concentration, urbanization, healthcare accessibility, livelihood patterns, and nutritional transition.

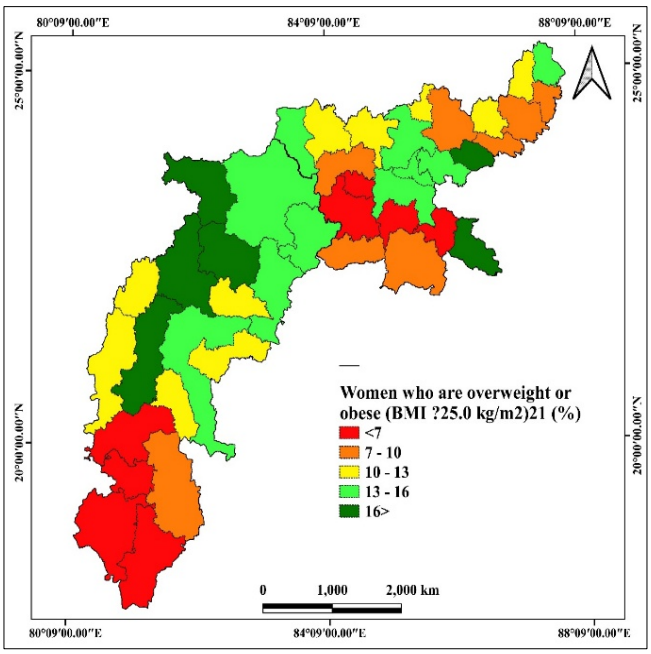
Prevalence of Low Body Mass Index among Women

Body Mass Index (BMI) is widely used as an indicator of nutritional status and chronic energy deficiency among adults. Women with BMI below 18.5 kg/m² are considered undernourished and nutritionally vulnerable.

The spatial distribution of low BMI among women reveals significant regional disparities in both Chhattisgarh and Jharkhand. In Chhattisgarh, the central and northern districts including Raipur, Durg, Rajnandgaon, Bilaspur, and Janjgir-Champa show higher concentration of undernourished women. In contrast, southern tribal districts such as Bastar, Dantewada, Sukma, Kanker, and Narayanpur demonstrate comparatively better BMI outcomes. In Jharkhand, the northern districts including Sahibganj, Pakur, and Godda display relatively higher undernutrition, whereas southern districts such as West Singhbhum and Simdega show comparatively better conditions.

The observed spatial pattern indicates that women's undernutrition is closely associated with poverty, livelihood insecurity, healthcare accessibility, dietary inadequacy, and socio-economic inequality. Several studies have emphasized that women in rural and economically vulnerable households often face dietary disadvantages due to unequal intra-household food distribution and reproductive burden (Bentley & Griffiths, 2003) [1]. Interestingly, some tribal districts demonstrate relatively better BMI outcomes despite lower economic development. This may partly reflect the continued role of traditional food systems, higher physical activity, and dietary diversity associated with forest-based livelihoods. Similar observations have been made in studies examining indigenous dietary systems in tribal regions (FAO, 2022).





Overweight and Obesity among Women

The spatial distribution of overweight and obesity among women presents a reverse pattern compared to undernutrition. In Chhattisgarh, urban and economically advancing districts including Raipur, Durg, Bilaspur, and Korba demonstrate higher prevalence of overweight and obesity. Southern tribal districts such as Bastar, Dantewada, and Sukma show relatively low prevalence.

A similar pattern is visible in Jharkhand where Ranchi, East Singhbhum, and Dhanbad exhibit higher obesity prevalence, while districts such as Palamu, Garhwa, and Sahibganj remain comparatively lower. This pattern reflects the process of nutritional transition occurring in rapidly urbanizing and industrializing regions. According to Popkin *et al.* (2020) [7], changing food habits, reduced physical activity, increased processed food consumption, and sedentary lifestyles are major contributors to rising obesity in developing countries. The coexistence of obesity and undernutrition within the same states highlights the dual burden of malnutrition. Urban and economically developed districts increasingly face lifestyle-related nutritional problems, while rural and tribal areas continue to struggle with chronic undernutrition. The findings also suggest that tribal and remote districts continue to retain relatively traditional food systems and physically

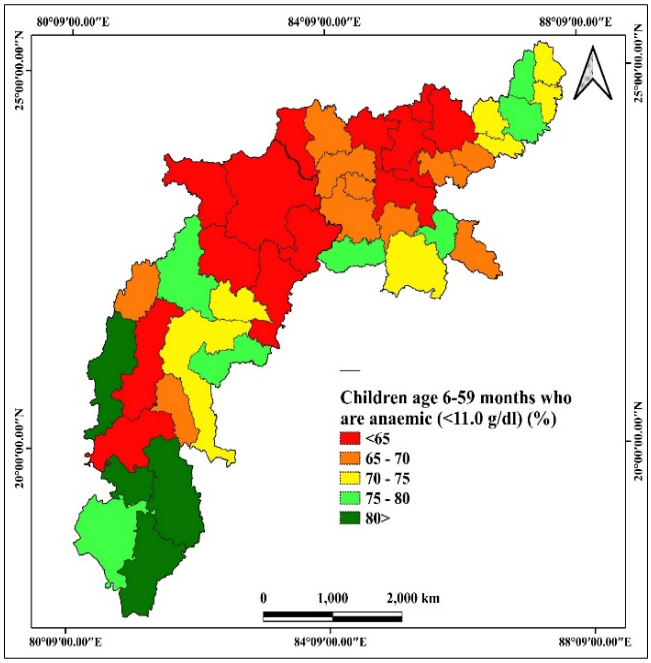
active lifestyles, resulting in lower obesity prevalence. However, ongoing market integration and dietary transitions may gradually alter these patterns in the future.

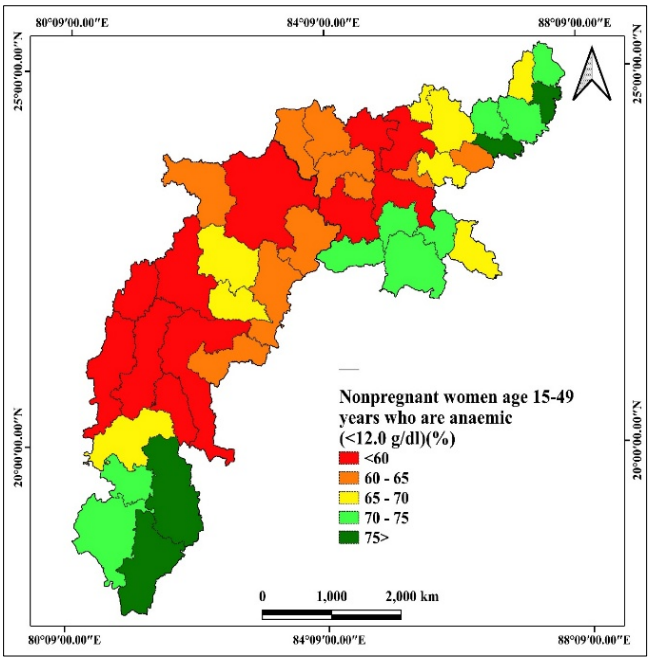
Anaemia among Children Aged 6–59 Months

Anaemia among children remains one of the most severe nutritional challenges in India. Anaemia affects cognitive development, physical growth, immunity, and educational outcomes among children.

The spatial distribution of child anaemia in both states reveals alarmingly high prevalence. In Chhattisgarh, districts such as Raipur, Durg, Rajnandgaon, Bilaspur, and Korba show very high anaemia prevalence. Although southern districts including Bastar, Dantewada, Sukma, Kanker, and Narayanpur show relatively better categories, anaemia levels remain critically high across all districts. In Jharkhand, the spatial pattern is comparatively mixed. Northern districts including Sahibganj, Pakur, and Godda demonstrate somewhat better outcomes, while central districts such as Ranchi, Hazaribagh, and Bokaro reveal higher anaemia prevalence.

The widespread prevalence of anaemia among children indicates deficiencies in dietary iron intake, poor maternal nutrition, recurrent infections, low dietary diversity, and inadequate healthcare accessibility. UNICEF (2021) and WHO (2020) [9] have identified childhood anaemia as a major public health challenge in developing countries. The persistence of child anaemia despite public nutrition programmes suggests that nutritional interventions need to move beyond supplementation alone and incorporate dietary diversity, maternal education, sanitation improvement, and healthcare strengthening.





Anaemia among Non-Pregnant Women

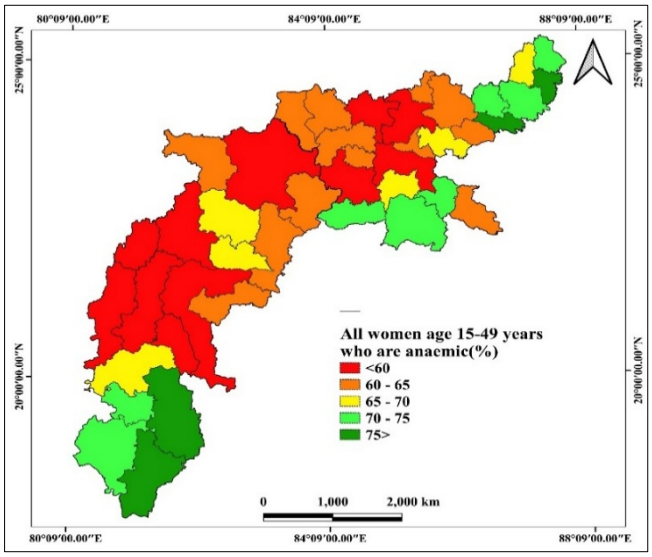
Anaemia among non-pregnant women reflects broader nutritional and reproductive health conditions. The spatial pattern again demonstrates stronger concentration in Chhattisgarh. Districts including Raipur, Durg, Rajnandgaon, Bilaspur, and adjoining central districts reveal high prevalence of anaemia among women. Southern districts such as Bastar and Dantewada show relatively better conditions. In Jharkhand, central and northeastern districts demonstrate mixed categories with persistent but regionally variable anaemia burden.

Women's anaemia is influenced by multiple factors including iron deficiency, dietary insufficiency, maternal workload, reproductive burden, poverty, and limited healthcare access. Bentley and Griffiths (2003) [1] emphasized that anaemia among women is closely associated with gendered nutritional inequality and inadequate dietary intake. The persistence of high anaemia among women has long-term implications not only for maternal health but also for child nutrition because maternal anaemia significantly affects birth outcomes, infant health, and intergenerational nutritional cycles.

Overall Anaemia among Women age 15–49 years

The pattern of total anaemia among women aged 15–49 years further confirms the widespread nutritional vulnerability across both states. Chhattisgarh demonstrates particularly high concentration in central and northern districts including Raipur, Durg, Rajnandgaon, Bilaspur, and Janjgir-Champa. Southern districts show relatively better outcomes, although anaemia remains widespread even there. In Jharkhand, districts such as Ranchi, Hazaribagh, Bokaro, and Dhanbad reveal high prevalence, while northern districts show relatively moderate conditions. The findings indicate that anaemia remains one of the most serious public health challenges among women in both states. The persistence of high anaemia reflects deeper structural inequalities including poverty, food insecurity, healthcare gaps, and nutritional awareness deficits.

The present study highlights the complex nutritional landscape of Chhattisgarh and Jharkhand characterized by the coexistence of undernutrition, anaemia, overweight, and obesity. The findings strongly support the concept of the "double burden of malnutrition" discussed by Popkin *et al.* (2020) [7], where traditional nutritional deficiencies coexist alongside emerging lifestyle-related health conditions.



Discussion on Spatial Pattern

The spatial analysis of nutritional indicators in Chhattisgarh and Jharkhand reveals significant regional disparities in women's nutritional health and anaemia prevalence. The observed patterns indicate that nutritional conditions are unevenly distributed across districts and are associated with broader socio-economic and developmental differences. Similar regional disparities in nutritional indicators have been identified in previous NFHS-based studies conducted in India (Menon *et al*, 2018).

The concentration of low Body Mass Index (BMI) among women in the central and northern districts of Chhattisgarh and northern districts of Jharkhand reflects persistent undernutrition in economically vulnerable regions. Studies have shown that chronic energy deficiency among women is strongly associated with poverty, low dietary intake, poor maternal health conditions, and limited access to healthcare services (Bentley & Griffiths, 2003) [1]. The NFHS-5 data similarly indicate that districts with relatively weaker socio-economic conditions continue to exhibit higher prevalence of undernutrition among women.

At the same time, the spatial distribution of overweight and obesity demonstrates a contrasting pattern. Urbanized and industrial districts such as Raipur, Durg, Bilaspur, Ranchi, Dhanbad, and East Singhbhum exhibit comparatively higher prevalence of overweight and obesity among women. This pattern is consistent with the concept of nutritional transition discussed by Popkin *et al*. (2020) [7], where increasing urbanization, dietary change, reduced physical activity, and lifestyle transformation contribute to rising obesity in developing regions. The coexistence of undernutrition and obesity within the same states reflects the "double burden of malnutrition," which has become increasingly visible in India and other low- and middle-income countries (Black *et al*, 2013; Popkin *et al*, 2020) [2, 7].

The spatial pattern also indicates that several southern tribal districts in both states demonstrate comparatively lower prevalence of overweight and obesity. Previous studies have suggested that tribal and forest-based communities often continue to retain relatively traditional dietary practices and physically active livelihood systems compared to rapidly urbanizing regions (Food and Agriculture Organization [FAO], 2022) [4]. However, the present study remains limited to secondary spatial analysis and therefore does not establish direct causal relationships between food systems and nutritional outcomes.

The prevalence of anaemia among children aged 6–59 months remains critically high across both states. The spatial concentration of child anaemia in several districts of Chhattisgarh and Jharkhand corresponds with broader national concerns regarding micronutrient deficiency among children. According to UNICEF (2021) and WHO (2020), childhood anaemia remains one of the major nutritional challenges affecting growth, immunity, and cognitive development in developing countries. The persistence of high anaemia prevalence despite ongoing nutritional programmes indicates that nutritional deprivation continues to remain a serious public health issue.

Similarly, anaemia among women aged 15–49 years demonstrates widespread regional prevalence across both states, particularly in central Chhattisgarh. Bentley and Griffiths (2003) [1] observed that anaemia among women in India is closely linked with nutritional deficiency, reproductive burden, and poor dietary intake. The present analysis also reflects that anaemia remains a persistent condition across both rural and semi-urban districts. The findings are consistent with NFHS-5 national trends, which indicate rising anaemia prevalence among women and children in several Indian states despite policy interventions (International Institute for Population Sciences [IIPS] & ICF, 2021).

The spatial distribution of nutritional indicators further demonstrates that district-level analysis provides more meaningful understanding than aggregated state-level averages. Menon *et al*. (2018) emphasized that district-scale nutritional assessment is essential for identifying localized patterns of nutritional deprivation and for improving targeted policy interventions. The present study similarly identifies considerable intra-state variation within both Chhattisgarh and Jharkhand.

The findings collectively suggest that nutritional conditions in the study area are shaped through multiple interacting factors including regional inequality, healthcare accessibility, urbanization, dietary transition, and socio-economic conditions. However, the present study is based on secondary data analysis and spatial interpretation; therefore, detailed causal explanation requires further field-based investigation and micro-level socio-cultural analysis.

Conclusion

The study demonstrates that significant nutritional disparities exist across districts of Chhattisgarh and Jharkhand. Both states continue to experience high levels of undernutrition and anaemia, while urban districts increasingly exhibit rising overweight and obesity among women. The findings reveal clear regional inequalities where central plains and urban-industrial districts differ significantly from tribal southern regions in nutritional outcomes. The coexistence of undernutrition and obesity highlights the ongoing nutritional transition in these states.

The study emphasizes the importance of geographically differentiated nutritional policies that integrate healthcare, maternal nutrition, dietary diversity, traditional food systems, and livelihood security. Strengthening region-specific nutritional interventions, community participation, and culturally sensitive food policies will be essential for improving women's and children's nutritional health in the future.

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