

ORIGINAL ARTICLE



Maternal mortality, anaemia, and gender parity: The North-East Indian paradox

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ABSTRACT

This paper investigates the paradoxical dynamics of gender and health in North-East India (NEI), situating regional outcomes within national and global contexts. While the region demonstrates relatively favourable gender parity indicators and comparatively balanced child sex ratios, contrasting sharply with the son-preference patterns observed in several northern Indian states, its Reproductive and Child Health (RCH) outcomes continue to reflect persistent structural and institutional deficits. Guided by the Social Determinants of Health (SDH) framework, the study examines the interrelationship between gender parity, women's empowerment, nutrition, healthcare accessibility, and maternal and child health outcomes across selected North-Eastern and Indian states. Using secondary data from the National Family Health Survey (NFHS)-5, SRS Bulletins, Census of India, and the Women's Empowerment Index (WEI) framework, the study adopts a descriptive and comparative approach supplemented by exploratory correlation analysis. The findings reveal a broader "developmental disconnect" in the region, where more balanced socio-cultural gender indicators coexist with poor maternal and child health outcomes. Assam recorded a Maternal Mortality Ratio (MMR) of 195 per 100,000 live births alongside anaemia prevalence of 66 percent among women and 68.4 percent among children. Comparative analysis with Kerala and Tamil Nadu further highlights that cultural parity alone cannot ensure better health outcomes in the absence of adequate healthcare infrastructure, nutritional security, and institutional support systems. The paper argues for integrated, gender-responsive public health systems that simultaneously address socio-cultural strengths, nutrition, healthcare accessibility, and structural inequalities to achieve sustainable RCH outcomes in the region.

KEY WORDS

Child nutrition; Gender-responsive policy; Health infrastructure; Reproductive and child health; Spousal violence; Women's empowerment

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Introduction

Gender inequality remains a major hurdle to truly inclusive growth. The World Economic Forum projects that, at the current rate of progress, it will take approximately 123 years for the world to achieve full gender parity. India's progress is also quite concerning, as the country ranks 131st out of 148 countries in the Global Gender Gap Index and almost at the bottom (143rd) in the Health and Survival dimension [1]. However, the North-East Indian (NEI) region presents several distinctive patterns. Unlike many other parts of the country, where "son preference" remains a deeply embedded socio-cultural phenomenon and millions of women are effectively missing from demographic statistics, the NEI region often demonstrates comparatively higher female survival rates at birth (Economic Advisory Council to the Prime Minister (EAC-PM); International Institute for Population Sciences [2,3]. This contrast is particularly relevant in the context of Sen's concept of "missing women" and his later discussion of the multiple dimensions of gender inequality, which emphasise that demographic balance alone does not necessarily imply broader gender equality [4,5].

Son preference in India reflects deeply rooted patriarchal attitudes in which sons are often socio-economically preferred over daughters. Such preferences contribute to adverse child sex ratios and the phenomenon of "missing women" in several

parts of the country. However, the North-Eastern region presents a contrasting demographic pattern. States such as Arunachal Pradesh and Assam report comparatively balanced child sex ratios of 972 and 962, respectively, substantially above Haryana's 834 and the national average of 919 [6]. These relatively favourable gender indicators distinguish the region from many northern Indian states, where son preference remains more pronounced.

Despite these comparatively balanced socio-cultural indicators, the NEI region does not necessarily reflect better health outcomes. Reproductive and maternal health indicators continue to reveal substantial disparities across the region. Assam, for instance, recorded a MMR of 195 deaths per 100,000 live births, which is substantially higher than the national average of 97 [7].

Long-term evidence suggests that India has made substantial progress in reducing maternal mortality over the last two decades. However, the pace of improvement remains uneven across states, with regions such as North-East India continuing to experience comparatively higher maternal health risks [8].

Similarly, access to basic maternal healthcare services remains inadequate in several states. In Nagaland, only about 21 percent of

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women receive at least four antenatal care visits during pregnancy, which is significantly below the national average of 58.1 percent [3].

Recent evidence further suggests that unmet need for family planning remains a significant challenge in India, particularly among socio-economically disadvantaged groups. Using NFHS-5 data, Singh et al., found that educational attainment, household wealth, and access to healthcare services significantly influence family planning utilisation and reproductive health outcomes [9].

The nutritional dimension of RCH also remains deeply concerning. Anaemia among women aged 15-49 years in India increased to around 57 percent in NFHS-5, while anaemia among children aged 6-59 months reached 67.1 percent [3]. However, anaemia is not merely an Indian problem; globally, it is expected to affect nearly one in three women by 2030 (UN Women and United Nations Department of Economic and Social Affairs) [10]. Such nutritional deprivation has serious implications not only for maternal health outcomes but also for child health, intergenerational malnutrition, and overall human development.

Existing studies on RCH in North-East India have largely focused either on maternal health indicators or on gender dimensions separately. Earlier studies have highlighted the significant role of geographical isolation, socio-economic disparities, and healthcare inaccessibility in shaping maternal healthcare utilisation and maternal health outcomes in North-East India. Physical accessibility, infrastructural deficiencies, difficult terrain, and the uneven distribution of healthcare facilities continue to influence antenatal care utilisation and institutional delivery rates across the region [11,12]. These structural constraints often limit timely access to maternal health services, particularly among women residing in remote and rural areas, thereby contributing to persistent regional disparities in RCH outcomes. However, limited scholarship has attempted to critically analyse the paradoxical coexistence of comparatively favourable gender parity indicators with poor maternal, nutritional, and healthcare outcomes across North-East India through an integrated socio-health perspective.

Against this background, the present study attempts to bridge this gap through a comparative analysis of gender parity, maternal health, anaemia, nutrition, healthcare utilisation, and women's empowerment indicators across selected North-Eastern and Indian states. The study further seeks to examine how favourable socio-cultural gender indicators in the region often coexist with weak healthcare infrastructure, nutritional insecurity, and institutional inadequacies, thereby reflecting a broader "developmental disconnect" within the RCH landscape of North-East India.

Theoretical framework: SDH and gendered health outcomes

The present study is guided by the SDH framework, which emphasises that health outcomes are shaped not only by biological or medical factors but also by broader socio-economic, cultural, environmental, and institutional conditions. In the context of RCH, factors such as women's education, nutrition, healthcare accessibility, household decision-making power, public infrastructure, and prevailing gender norms significantly influence maternal and child health outcomes.

The NEI region provides a unique context for examining these relationships. Unlike several northern Indian states characterised by strong son preference and adverse child sex ratios, many North-Eastern states demonstrate favourable gender indicators and greater household-level participation of women. However, despite these socio-cultural advantages, several states in the region continue to experience high maternal mortality, widespread anaemia, poor nutritional outcomes, and inadequate maternal healthcare utilisation.

This contradiction reflects a broader socio-health paradox, where relatively favourable gender parity does not necessarily translate into improved health outcomes. The SDH framework helps explain this paradox by highlighting the role of structural determinants such as geographical isolation, weak healthcare infrastructure, shortages of trained health personnel, poor transportation networks, nutritional insecurity, and uneven implementation of welfare programmes.

The framework further recognises gender itself as a structural determinant of health, influencing women's nutritional status, healthcare-seeking behaviour, exposure to violence, and reproductive autonomy. By situating the analysis within the SDH framework, the study adopts an integrated perspective linking gender parity, healthcare infrastructure, nutrition, and institutional accessibility in understanding RCH outcomes in North-East India.

The SDH approach is closely linked with the work of Marmot and the WHO Commission on SDH, which argue that health inequalities arise from unequal access to resources, opportunities, and public services [13,14]. This perspective is particularly relevant in the North-Eastern region, where geographical isolation, infrastructural deficits, and socio-economic disparities continue to shape maternal and child health outcomes despite favourable gender indicators.

Methodology

The present study is based entirely on secondary data collected from nationally and internationally recognised sources, including the NFHS-5 (IIPS and ICF, 2021), Sample Registration System (SRS) Bulletins on MMR, Census of India 2011, reports of the Ministry of Health and Family Welfare (MoHFW), and selected scholarly studies and policy reports related to gender and health in India [2,6,15].

The study adopts a descriptive and comparative analytical framework to examine the relationship between gender parity, women's empowerment, nutrition, and RCH outcomes in NEI. Comparative analysis has been conducted among the eight North-Eastern states along with selected benchmark states such as Kerala, Tamil Nadu, and Haryana, using indicators including MMR, antenatal care coverage, institutional delivery, child sex ratio, anaemia prevalence, child nutrition indicators, women's empowerment, and spousal violence.

In addition to descriptive and comparative analysis, Pearson's correlation analysis was conducted using selected state-level indicators derived from NFHS-5 and the WEI framework developed by Vignitha et al. [16,17]. The analysis was carried out using aggregate state-level data for selected Indian states, including the North-Eastern region, to identify broad associations among women's empowerment, nutrition, maternal healthcare utilisation, and gender-based vulnerabilities.

Since the analysis is based on a limited number of aggregate observations and secondary datasets from different reporting periods, the correlations are interpreted only as exploratory associations rather than statistically causal relationships. The findings are therefore intended primarily for comparative and interpretive purposes.

The study draws upon multiple secondary data sources, including Census 2011, NFHS-5, and SRS Bulletins, because no single dataset provides comprehensive information on all dimensions of gender, nutrition, maternal health, child health, and demographic outcomes required for the analysis [6,7,16,18]. Each source offers distinct and complementary indicators: Census 2011, provides demographic measures such as the child sex ratio; NFHS-5 supplies detailed information on women's empowerment, maternal healthcare utilisation, nutrition, and gender-based violence; while the SRS Bulletins provide the most reliable estimates of MMR at the state level [6,16]. Consequently, the study integrates the most recent and authoritative data available for each indicator to facilitate a comprehensive assessment of gender and reproductive health disparities in North-East India. As these datasets pertain to different reference periods, the analysis focuses on broad comparative patterns and interrelationships rather than strict temporal comparisons, and the findings are interpreted with due caution.

Comparative Regional Analysis of Gender Development Indicators

NEI presents a unique development paradigm when compared with the national average, and the comparison becomes more analytically significant when undertaken alongside socio-economically advanced South Indian states on one hand and economically developed but gender-skewed northern states on the other. Evidence from the eight North-Eastern states- Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura- has been compared with benchmark states such as Kerala, Tamil Nadu, and Haryana across selected RCH indicators.

Reproductive and maternal health outcomes

Maternal mortality remains one of the clearest indicators of regional health inequality. Although India's national MMR has declined to 97 per 100,000 live births, Assam still reports a significantly high MMR of 195, which remains among the highest in the country and nearly ten times higher than Kerala's MMR of 19 [7]. The factors underlying this situation are largely structural in nature. In Assam, a government audit revealed a 45 percent shortage of doctors and nearly half the required number of nurses compared to national standards [19].

Table 1 reveals substantial regional disparities in maternal healthcare utilisation. Nagaland records the lowest percentage of women receiving at least four antenatal care visits at only 20.7 percent, whereas Tamil Nadu reports more than 90 percent coverage [3]. Kerala demonstrates the strongest maternal healthcare performance in terms of institutional deliveries, while Meghalaya and Nagaland remain considerably behind at 58.1 percent and 46.0 percent, respectively.

The coexistence of low antenatal care coverage and poor institutional delivery in Nagaland indicates that household-level women's agency may not necessarily translate into effective utilisation of formal maternal healthcare systems. This reflects persistent barriers related to healthcare accessibility, geographical isolation, and institutional infrastructure.

Importantly, even in states such as Mizoram, where institutional delivery rates remain relatively high, significant urban-rural disparities continue to persist. Urban institutional deliveries were estimated at around 98.8 percent, whereas rural rates remained closer to 72.5 percent. This suggests that regional averages may sometimes conceal substantial intra-state inequalities in maternal healthcare access.

Child health and the gender parity paradox

Despite infrastructural limitations, the NEI region demonstrates comparatively favourable performance in terms of gender parity at birth. According to the Census, 2011 estimates, Arunachal Pradesh recorded a Child Sex Ratio of 972, substantially above the national average of 919 and considerably higher than Haryana's 834 [3,6]. As reflected in Table 2, all North-Eastern states report child sex ratios above the national average, while several states in the region also perform better than Kerala (957).

These findings indicate that the strong son-preference patterns commonly observed in several northern Indian states are relatively less pronounced in the North-Eastern region [2]. However, the comparatively favourable gender parity indicators in the region do not necessarily correspond with improved maternal and child health outcomes, thereby reflecting a broader structural contradiction.

Vignitha et al., using NFHS-5 data, developed a comprehensive WEI consisting of 39 indicators grouped into four sub-indices: economic empowerment, decision-making, health and nutrition, and gender role attitudes [17]. Among these, the decision-making sub-index ranges from 0 to 6, with higher values indicating greater participation of women in household decision-making processes.

The findings indicate substantial interstate variation in women's empowerment dimensions across India. Sikkim and Arunachal Pradesh record comparatively high economic

Table 1. Comparative maternal health indicators (NFHS-5) [16].

State/Region	MMR (per 100k)	4+ Antenatal Care (ANC) Visits (%)	Institutional Deliveries (%)
Arunachal Pradesh	N/A	36.6	79.2
Assam	195	50.7	84.0
Manipur	N/A	79.4	79.0
Meghalaya	N/A	52.2	58.1
Mizoram	N/A	58.1	86.0
Nagaland	N/A	20.7	46.0
Sikkim	N/A	58.4	95.0

Tripura	N/A	55.2	89.0
Kerala	19	81.3	99.8
Tamil Nadu	54	90.6	100.0
Haryana	110	60.9	95.0
National Average	97	58.5	88.6

Source: Authors' compilation from NFHS-5 India Report and SRS Special Bulletin on Maternal Mortality in India (2018-20) [16].

Table 2. Gender parity and WEI.

State/ Region	Child Sex Ratio	WEI (0-39)	Economic Empowerment Sub-index (0-9)	Decision-Making Sub-index (0-6)	Health and Nutrition Sub- index (0-17)	Gender Role (0-7)
Arunachal Pradesh	972	22.77	6.05	2.73	10.37	3.61
Assam	962	21.30	3.04	3.21	10.97	4.07
Manipur	936	20.51	3.97	3.57	9.55	3.42
Meghalaya	970	20.10	4.55	3.54	7.93	4.08
Mizoram	970	24.07	3.48	4.50	10.69	5.40
Nagaland	943	23.88	2.69	5.64	9.28	6.27
Sikkim	957	25.84	6.10	2.92	11.85	6.98
Tripura	957	19.97	3.21	3.49	8.58	4.70
Haryana	834	21.13	3.53	2.66	9.49	5.45
Kerala	964	21.23	3.28	2.49	10.14	5.32
National Average	919	21.30	N/A	N/A	N/A	N/A

Sources: Census of India; Vignitha et al. [6,17].

Note: Child sex ratio figures are based on Census 2011, whereas women's empowerment indicators are based on NFHS-5 data compiled by Vignitha et al. [6,16]. The indicators are used for comparative interpretation rather than direct temporal analysis.

empowerment scores, whereas Assam and Nagaland perform relatively poorly. Nagaland and Mizoram demonstrate higher decision-making scores, while Meghalaya reports one of the lowest health and nutrition sub-index values among the states considered. These variations suggest that improvements in household-level agency do not always correspond with improvements in healthcare utilisation and nutritional outcomes, particularly in regions characterised by infrastructural and geographical constraints.

The nutritional crisis: Anaemia in the region

Despite relatively better performance in several gender indicators, many states in the North-Eastern region continue to experience a serious nutritional crisis. NFHS-5 data indicate that nearly 57 percent of women in India are anaemic [3,16]. Among the North-Eastern states, Assam, which also reports one of the highest maternal mortality levels in the country, records anaemia prevalence among women around 66 percent, substantially above both the national average and the projected global average of 33 percent by 2030 [3,10].

Assam is not an isolated case within the region. Tripura reports anaemia prevalence of 67.2 percent among women, while Meghalaya records 53.8 percent. Existing studies suggest that poor dietary diversity, nutritional deprivation, and gendered food practices such as the "last to eat" norm in rural households contribute significantly to the persistence of anaemia among women [17,20].

In contrast, states such as Manipur and Nagaland report comparatively lower anaemia prevalence and may therefore provide important policy insights for targeted nutritional interventions. These findings collectively indicate that better gender parity indicators alone are insufficient to ensure improved maternal and nutritional health outcomes in the absence of adequate nutritional security, healthcare infrastructure, and institutional support systems.

Sexual and Gender-Based Violence (SGBV)

Spousal violence

NFHS-5 data indicate that violence against women continues to remain a pervasive challenge in India, with a significant proportion of ever-married women reporting experiences of spousal violence [3,16]. Although the North-Eastern region demonstrates comparatively favourable gender indicators in several dimensions, the prevalence of SGBV continues to remain a serious concern. While most North-Eastern states show a declining trend in spousal violence compared to NFHS-4 estimates, certain states continue to record prevalence levels above the national average, as reflected in Table 3 [21].

Table 3. Any spousal (physical, sexual, or emotional) violence by husband or wife in India (NFHS-4 vs NFHS-5) [16,21].

State/Region	NFHS-5 (%)	NFHS-4 (%)
India Average	32.0	31.0
Arunachal Pradesh	27.0	35.0
Assam	34.0	27.0
Manipur	42.0	55.0
Meghalaya	21.0	31.0
Mizoram	12.0	18.0
Nagaland	11.0	17.0
Sikkim	21.0	3.5
Tripura	23.0	30.0
Tamil Nadu	40.0	45.0
Uttar Pradesh	37.0	38.0
Punjab	13.0	21.0

Sources: Authors' compilation from NFHS-5 (2019-21) India Report, Figure 15.5, and NFHS-4 (2015-16) India Report, Figure 16.6 (IIPS and MoHFW, Government of India) [3,4,21].

Table 3 reveals substantial interstate variation in spousal violence. Nagaland records the lowest regional prevalence at 11 percent, which also corresponds with relatively higher household decision-making autonomy among women, as reflected in Table 2. In contrast, Manipur (42 percent) and Assam (34 percent) report prevalence levels above the national average, indicating that comparatively favourable gender parity indicators do not necessarily ensure lower levels of domestic violence.

Socio-economic dimensions of spousal violence

Although spousal violence shows a declining trend in India overall and across several North-Eastern states between NFHS-4 and NFHS-5, Assam and Sikkim exhibit an increase in reported cases. Multiple socio-economic factors appear to influence the prevalence and reporting of spousal violence, including place of residence, educational status, employment patterns, alcohol consumption behaviour, caste and religious background, and women's fear of their husbands.

The patterns presented in Table 4 suggest several important associations. First, Spousal violence exhibits differing rural-urban patterns across the two states. In Assam, prevalence remains higher in rural areas, whereas in Sikkim, reported violence is relatively higher among urban women. Second, higher reporting of violence is observed among women with relatively higher educational attainment. This may partly reflect increased awareness and reporting among educated women rather than indicating that education itself increases violence. Third, women employed for cash employment also report comparatively higher levels of spousal violence. While the present study does not establish causality, this pattern may indicate tensions arising from changing household power relations and economic dynamics. Fourth, alcohol consumption behaviour among husbands demonstrates a strong association with reported spousal violence, particularly among women whose husbands "often get drunk."

Another significant finding is the relationship between women's fear of their husbands and reported violence.

Table 4. Any spousal (physical, sexual, or emotional) violence by husband or wife in Assam and Sikkim: Major sub-components (NFHS-4 vs NFHS-5).

Parameter	Assam		Sikkim	
	NFHS-5	NFHS-4	NFHS-5	NFHS-4
Residence				
Urban	28.0	18.2	28.3	1.1
Rural	35.0	28.4	17.7	5.7
Educational Characteristics				
Wife has no schooling	42.8	41.3	19.0	10.2
Husband has no schooling	43.5	42.2	NA	8.0
Neither has schooling	45.6	43.0	NA	11.3
Husband has more schooling	33.0	25.9	16.0	4.8
Wife has no schooling	32.9	25.3	26.2	0.9
Both have equal schooling	28.7	15.7	19.3	2.8
Religious Characteristics				
Hindu	31.6	25.0	21.3	4.2
Muslim	38.2	29.9	NA	NA
Christian	33.8	36.0	15.0	12.1
Caste/Tribe				
Scheduled Caste	35.3	30.8	NA	NA
Scheduled Tribe	33.9	23.2	12.4	3.0
Other backward caste	33.7	26.6	23.0	2.3
Others	34.0	26.6	NA	5.7
Employment status in the last 12 months				
Not employed	29.6	24.6	16.8	4.6
Employed for cash	49.1	36.7	22.0	1.3
Employed not for cash	40.9	29.4	NA	NA
Husband's alcohol consumption				
Does not drink	28.8	21.2	11.6	2.4
Gets drunk sometimes	44.7	33.8	19.6	2.8
Gets drunk often	57.3	57.6	65.8*	31.3*
Afraid of husband				
Most of the time	63.2	54.1	46.7*	6.4*
Sometimes	34.4	25.9	16.5	4.4
Never	17.1	14.7	19.0	1.7

Source: Author's compilation based on NFHS-5 (2019-21) State Reports of Assam and Sikkim (Tables 107-108) and NFHS-4 (2015-16) State Reports of Assam and Sikkim (Tables 97-99), published by the IIPS and MoHFW, Government of India [2,16,21].

Note: Percentages are based on ever-married women. Figures in parentheses are based on 25-49 unweighted cases.

Women who reported being afraid of their husbands “most of the time” also reported substantially higher levels of spousal violence. NFHS-5 further highlights the intergenerational dimension of domestic violence, showing that women whose mothers experienced domestic violence were more likely to experience abusive marital relationships themselves.

Overall, these findings suggest that gender violence in the region is shaped not only by household-level gender relations but also by broader socio-economic, behavioural, and intergenerational factors.

Other dimensions of gender violence

Gender-based violence in North-East India extends beyond spousal violence and is often shaped by broader social, political, and institutional contexts. The Prajnya Report (2025) notes that women in conflict-prone and geographically isolated regions may face heightened vulnerabilities arising from displacement, insecurity, limited access to justice, and weak institutional support mechanisms [22]. Such challenges can adversely affect women's physical safety, mental well-being, and access to essential health and social services.

Another emerging dimension is technology-enabled gender violence. National Crime Record Bureau (NCRB) reported more than 14,000 cybercrime cases against women in India in 2022 [23]. In the North-Eastern region, relatively lower digital literacy and limited institutional awareness may further increase women's vulnerability to online harassment and cyber exploitation [22].

These patterns collectively reinforce the broader structural challenges affecting women's wellbeing in the region. While several North-Eastern states demonstrate comparatively favourable gender parity indicators, significant gaps persist in healthcare accessibility, nutritional security, institutional responsiveness, and protection from gender-based violence.

The MoHFW has emphasised the importance of survivor-centred medico-legal care, timely health services, and institutional support mechanisms for victims of sexual violence. Strengthening such systems remains particularly important in vulnerable and conflict-affected regions of North-East India [15].

Child Health and Nutrition: The Regional Status

On the child health and nutrition front, North-East India faces complex challenges. While the region demonstrates relatively favourable gender parity at birth, significant nutritional inadequacies continue to undermine these advantages. Although stunting and wasting rates in several North-Eastern states remain lower than the national average, anaemia among women and children continues to represent a major public health concern [3].

Anthropometric indicators: Stunting, wasting, and underweight

NFHS-5 data reveal that nearly 36 percent of Indian children under five are stunted (low height-for-age), while about 19 percent are wasted (low weight-for-height). Except for Meghalaya, most states in the North-Eastern region perform comparatively better than the national average on these indicators (Table 5). Sikkim records a stunting rate of 22 percent, Manipur 23 percent, and Arunachal Pradesh 28 percent, whereas states such as Uttar Pradesh continue to report significantly higher levels at around 40 percent [3].

Similarly, in terms of underweight prevalence, most North-Eastern states perform relatively better than the national average. However, the situation remains concerning in relation to anaemia among children. Assam records anaemia prevalence among children at 68.4 percent, slightly above the national average of 67.1 percent, although the state still performs better than Haryana on this indicator (Table 5).

Table 5. Comparative Nutrition Indicators (NFHS-5).

State/Region	Child health/nutrition indicators					
	Stunted (Low height-for age)	Wasted (low weight-for height)	Underweight (low-weight-for-age)	Child anaemia (6–59 months)	Anaemia among women (15–49 years)	Anaemia in men
Arunachal Pradesh	28.0	13.0	15.0	56.6 (51.0)	40.0	22.0
Assam	35.0	22.0	33.0	68.4 (36.0)	66.0 (46.0)	36.0
Manipur	23.0	10.0	13.0	43.0 (23.0)	29.0 (26.0)	6.0
Meghalaya	47.0	12.0	27.0	45.1 (41.0)	54.0 (56.0)	26.0
Mizoram	29.0	10.0	13.0	46.4 (19.0)	35.0 (25.0)	16.0
Nagaland	33.0	19.0	27.0	42.7 (22.0)	29.0 (24.0)	10.0
Sikkim	22.0	14.0	13.0	56.4	42.0 (35.0)	19.0
Tripura	32.0	18.0	26.0	64.2 (48.0)	67.0 (54.0)	37.0
Kerala	23.0	16.0	20.0	39.4 (36.0)	36.0 (34.0)	18.0
Tamil Nadu	25.0	15.0	22.0	57.4 (50.0)	53.0 (51.0)	15.0
Haryana	28.0	12.0	22.0	70.4 (72.0)	61.0 (63.0)	19.0
National Average	36.0	19.0	32.0	67.1 (59.0)	57.0 (53.0)	25.0 (23.0)

Sources: Author's compilation from state-wise nutrition and anaemia indicators reported in the NFHS-5, 2019–21: India Report (IIPS and MoHFW, Government of India).

Note: Figures shown within brackets represent NFHS-4 estimates.

Although several North-Eastern states perform comparatively better than the national average, many continue to fall short of global nutritional benchmarks. According to WHO estimates, global stunting prevalence stood at approximately 23 percent in 2024, indicating that several states in the region still face substantial nutritional deficits [24].

Anaemia crisis in children and adolescents

NFHS-5 data further indicate that anaemia among children in India has increased significantly, reaching 67.1 percent, which is notably higher than NFHS-4 estimates [3]. Assam remains a major area of concern, with nearly seven out of ten children reported as anaemic. Women in the state also report comparatively high anaemia prevalence at 65.9 percent, among the highest in the North-Eastern region [3,20]. According to Sinha, persistent anaemia reflects broader nutritional and gender inequalities in access to food and health resources [20].

Although Assam ranked highest in anaemia among women during the NFHS-4 period, recent estimates indicate some relative improvement, with the state currently ranking fourth nationally (detailed explanation in Endnote ii). Nevertheless, the prevalence remains substantially above the projected global average of 33 percent for women by 2030 [10].

Adolescence further highlights the gendered dimensions of nutritional inequality. Across India, anaemia among girls aged 10-19 years remains substantially higher than among boys. While biological factors partly explain this difference, socio-cultural practices such as girls' "eating last and least" continue to contribute significantly to nutritional deprivation. States such as Assam and Tripura, where maternal anaemia remains extremely high, reflect an intergenerational cycle in which malnourished mothers are more likely to give birth to low-birth-weight children with poorer long-term health outcomes [20].

Medical evidence also suggests that genetic and ethnic factors may contribute to the high prevalence of anaemia in Assam. Sajid et al., identified higher frequencies of α -thalassaemia in parts of the state, which may partially influence anaemia prevalence [25]. However, nutritional deprivation, poor dietary diversity, and gendered food practices continue to remain important social determinants underlying the persistence of anaemia in the region.

Policy challenges and regional disconnect

Recent trends in public expenditure suggest that child development and nutrition programmes have not consistently received adequate financial priority. Programmes such as PM-POSHAN and ICDS (Anganwadi Services) have experienced funding constraints in recent years despite the continuing nutritional challenges faced by women and children [20].

The broader structural disconnect within the North-Eastern region becomes particularly visible in the nutrition sector.

Although several states demonstrate comparatively better gender parity and household-level women's agency, nutritional insecurity and healthcare accessibility remain uneven. States such as Nagaland continue to report high wasting levels despite relatively stronger decision-making autonomy among women [3].

Poor dietary diversity further intensifies the nutritional burden. In several regions, cereal-based diets continue to dominate, while protein-rich foods are not always adequately incorporated into public nutrition programmes [20]. These institutional and nutritional gaps weaken long-term improvements in maternal and child health outcomes.

The findings therefore suggest that favourable gender indicators alone are insufficient to ensure better nutritional and reproductive health outcomes. Achieving Sustainable Development Goal 2 (Zero Hunger) requires a broader life-cycle approach involving adolescent nutrition, maternal healthcare strengthening, dietary diversification, and sustained public investment in nutrition-sensitive welfare programmes [10,20].

Correlation between Women's Empowerment, Nutrition, and Maternal Healthcare Utilisation

To supplement the descriptive analysis, a simple correlation analysis was conducted using selected state-level indicators from NFHS-5 and the Women's Empowerment Index framework developed by Vignitha et al. [17]. The analysis examines the relationship between women's nutrition, empowerment, healthcare utilisation, and gender-based vulnerabilities across selected Indian states, including the North-Eastern region.

The findings reveal a strong positive relationship between women's anaemia and child anaemia ($r = +0.797$), indicating that states with higher maternal anaemia also tend to report higher child anaemia. This reflects the intergenerational nature of nutritional deprivation.

A strong positive association is observed between the WEI and the Health and Nutrition Index ($r = +0.705$), suggesting that higher levels of women's empowerment are generally associated with better health and nutritional conditions. Similarly, antenatal care utilisation and institutional delivery show a strong positive relationship ($r = +0.728$), indicating better maternal healthcare utilisation in states with stronger institutional health coverage.

The analysis also shows a moderate negative relationship between female literacy and spousal violence ($r = -0.491$), while WEI and spousal violence demonstrate a moderate negative association ($r = -0.529$). These findings suggest that higher levels of education and women's empowerment are generally associated with lower prevalence of domestic violence.

Interestingly, decision-making autonomy and institutional delivery exhibit a strong negative association ($r = -0.770$). This counterintuitive relationship may reflect structural disparities in geographically isolated states where relatively higher women's autonomy coexists with weaker healthcare infrastructure. Given the ecological and exploratory nature of the analysis, the findings should be interpreted cautiously and not as evidence of a causal relationship (Table 6).

Overall, the findings indicate that women's empowerment, nutrition, healthcare utilisation, and gender vulnerabilities are closely interconnected.

However, improvements in gender-related indicators alone may not automatically ensure better RCH outcomes without adequate healthcare infrastructure and institutional support systems.

Table 6. Correlation between selected gender, nutrition, and healthcare indicators.

Variables	Correlation Coefficient (r)	Interpretation
Women's Anaemia and Child Anaemia	+0.797	Strong positive relationship
WEI and Health and Nutrition Index	+0.705	Moderate positive relationship
ANC 4+ and Institutional Delivery	+0.728	Strong positive relationship
Female Literacy and Spousal Violence	-0.491	Moderate negative relationship
Decision-Making and Institutional Delivery	-0.770	Strong negative relationship
WEI and Spousal Violence	-0.529	Moderate negative relationship

Sources: Computed by the authors using NFHS-5 (2019-21) and Vignitha et al. [16,17].

Note: Pearson's correlation coefficients are based on aggregate state-level secondary data compiled from NFHS-5 (2019-21) and Vignitha et al. [16,17]. The estimates are exploratory in nature and indicate statistical associations rather than causal relationships.

Discussion

The interpretations presented in this study should be understood within the limitations of secondary datasets drawn from different reporting periods. The findings reveal a clear “developmental disconnect” in North-East India, where favourable gender parity indicators coexist with weak maternal and child health outcomes. While the region avoids the severe “missing women” crisis observed in several northern Indian states such as Haryana, infrastructural deficiencies and healthcare inequalities continue to increase maternal and nutritional vulnerabilities [2,3].

The findings reinforce the relevance of the SDH framework in explaining the coexistence of comparatively favourable gender indicators with poor RCH outcomes in the region. Several North-Eastern states demonstrate relatively balanced child sex ratios and greater household-level decision-making autonomy among women; however, these socio-cultural advantages do not necessarily translate into improved healthcare outcomes. Weak public health infrastructure, geographical isolation, shortages of trained healthcare personnel, nutritional insecurity, and inadequate institutional accessibility continue to constrain health improvements.

The contrast between Assam's MMR (195) and Kerala's (19) further illustrates the structural nature of regional health inequality MoHFW [26]. Shortages of doctors and nurses, difficult terrain, and limited emergency healthcare access remain significant barriers in several parts of the North-East. Recent assessments of the LaQshya initiative indicate that quality-improvement interventions in labour rooms and maternity wards can significantly strengthen maternal and newborn healthcare services when effectively implemented [27]. The findings therefore suggest that improvements in gender parity alone may not be sufficient to ensure better maternal and child health outcomes without corresponding institutional support systems.

Anaemia also emerges as a major public health concern in the

region. States such as Assam and Tripura report anaemia prevalence substantially above both national and global averages [2,3]. The persistence of high anaemia reflects the structural nature of nutritional deprivation, shaped by poor dietary diversity, gendered food practices, and broader socio-economic inequalities. Existing medical studies additionally indicate that ethnic and genetic factors may partly contribute to the high prevalence of anaemia in Assam [25].

The findings also suggest that favourable gender parity indicators do not necessarily translate into better health outcomes. Consistent with Sen's broader conception of gender equality, improvements in demographic indicators must be accompanied by better access to health, nutrition, and opportunities if substantive gender equality is to be achieved [5].

The findings are broadly consistent with earlier studies that emphasise the multidimensional nature of RCH in North-East India. Previous studies have demonstrated that geographical remoteness, infrastructural deficiencies, and socio-economic inequalities play a significant role in limiting access to maternal healthcare services and shaping maternal health outcomes in India. Spatial disparities in healthcare accessibility are particularly pronounced in remote and rural regions, where poor connectivity, inadequate health infrastructure, and socio-economic disadvantages constrain the utilisation of antenatal, delivery, and postnatal care services [28,29]. Similarly, Sinha emphasised that nutritional deprivation, inadequate dietary diversity, and unequal access to food and health resources represent important dimensions of gender inequality that adversely affect maternal and child health outcomes [20].

The present study extends these arguments by demonstrating that even comparatively favourable gender indicators may coexist with poor maternal and nutritional outcomes when institutional and infrastructural deficiencies remain unresolved.

Overall, the findings suggest that improving RCH outcomes in the region requires policy approaches extending beyond purely medical interventions and addressing broader social, nutritional, and infrastructural determinants of health.

Policy Recommendations

North-East India demonstrates that social empowerment alone may not be sufficient to ensure gender equality in health outcomes. Based on the findings of the study, the following policy measures are suggested:

Improvement in health infrastructure

The study reveals that states such as Assam and Nagaland continue to experience poor maternal healthcare outcomes, low antenatal care coverage, and shortages of skilled health personnel. Therefore, urgent investment in human resources for health is necessary. Expansion of the LaQshya programme and strengthening of Health and Wellness Centres may improve the quality of maternal and emergency obstetric care in underserved regions. Recent evidence suggests that the LaQshya initiative has contributed to improving the quality of labour room and maternity care services, thereby enhancing maternal and newborn health outcomes in public healthcare facilities [26,27].

Addressing nutritional deficiencies

Given the high prevalence of anaemia among women and children in several North-Eastern states, nutrition policies should focus on dietary diversity and micronutrient support in addition to calorie intake. Expansion of iron-folic acid supplementation and inclusion of protein-rich foods in nutrition programmes may help reduce long-term nutritional deprivation.

Strengthening gender-responsive data systems

Regular district-level monitoring and improved availability of gender-disaggregated health data are important for evidence-based planning and gender-responsive policy interventions. The adoption of gender-responsive budgeting frameworks can further improve the effectiveness of public health interventions by ensuring that the specific needs of women and marginalised groups are adequately reflected in resource allocation and programme implementation [30].

Addressing gender-based violence

The persistence of spousal violence in several states highlights the need for stronger counselling services, medico-legal support systems, and institutional protection mechanisms for women, particularly in vulnerable and conflict-prone areas.

Addressing SDH

Healthcare interventions should incorporate broader determinants such as education, dietary practices, livelihood conditions, geographical isolation, and socio-cultural characteristics while designing region-specific programmes.

Taken together, these recommendations support the study's central argument that improvements in gender parity indicators alone cannot ensure better RCH outcomes without corresponding institutional, nutritional, and infrastructural support.

Limitations of the Study

The study is based entirely on secondary data sources and descriptive comparative analysis. Differences in reference periods across datasets may affect the strict comparability of indicators. Further, due to the limited availability of comparable district-level data for all North-Eastern states, the analysis remains largely exploratory and state-level in nature.

The correlation estimates presented in the study indicate associations among variables rather than causal relationships. Future studies using unit-level datasets and advanced econometric techniques may provide deeper insights into the determinants of maternal and nutritional health outcomes in the region.

Conclusion

The study demonstrates that favourable gender parity indicators do not automatically ensure improved RCH outcomes in regions characterised by infrastructural and nutritional deprivation. Although several North-Eastern states show comparatively balanced gender indicators and greater household-level women's agency, persistent gaps in healthcare infrastructure, nutritional security, and institutional accessibility continue to constrain health improvements.

The findings, therefore, highlight the need for integrated and gender-responsive policy approaches that address both healthcare delivery and the broader social determinants shaping maternal and child health outcomes in North-East India.

Disclosure Statement

No potential conflict of interest was reported by the author.

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