Original Article

Studies on Nutritional Status, Dietary Patterns, Food Security and Wild Food Systems Among Tribal Communities of Tripura, Northeast India

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ABSTRACT

Tripura is home of 19 constitutionally recognised Scheduled Tribes who constitute approximately 31% of population. Despite occupying forest-rich landscapes with centuries of food for aging traditions, tribal communities in Tripura experience some of the most severe rates of child under nutrition, maternal anaemia and household food insecurity that found in the region. The present review synthesises evidence drawn from several peer-reviewed studies, national health datasets and programme reports (2000-2024); covering child growth and anthropometric failure, micronutrient deficiency disorders, infant and young child feeding (IYCF) practices, household food security, the nutritional contribution of wild and traditional food plants and the structural factors that sustain poor outcomes across generations. The findings reveal an unsatisfactory public health situation. Stunting affects 47.8% of tribal children below five years of age, wasting affects 22.4%, and anaemia is recorded in 57.9% of tribal women of reproductive age — each figure exceeding state averages by roughly 15 percentage points. Exclusive breastfeeding rates fall well below recommended thresholds, complementary feeding practices are frequently delayed and nutritionally inadequate, and more than half of tribal households experience moderate to severe food insecurity. Wild food plant systems continue to buffer micronutrient deficits in rural tribal diets but are being eroded by deforestation, agricultural change, and the steady loss of intergenerational botanical knowledge.

Keywords: Tribal; Tripura; food security; wild edible plants; Northeast India.

INTRODUCTION

The nutritional vulnerabilities of indigenous and tribal populations are not simply a reflection of poverty. They emerge from a deeper layering of dispossession — the removal of forest access, the erosion of traditional knowledge systems, the marginalisation of subsistence livelihoods, and the substitution of ecologically diverse food practices with market-dependent dietary patterns that offer less micronutrient richness. Across South and Southeast Asia, studies have consistently documented that forest-dependent communities which retain intact food foraging traditions show markedly lower rates of micronutrient deficiency than those who have been displaced or whose ecological resources have been depleted.[1,2,3] India's tribal communities present this dynamic with particular clarity.

India is home to an estimated 104 million tribal people representing over 700 distinct ethno-linguistic groups, many of whom inhabit biodiversity-rich landscapes across its eastern and northeastern highlands.[4] Despite occupying territories with enormous ecological potential for food security, tribal populations carry a disproportionate share of India's malnutrition burden. Stunting, wasting, and anaemia rates among Scheduled Tribe children consistently exceed national averages and diverge even more substantially from the nutrition indicators of non-tribal populations in the same states.[5,6] This gap has persisted across three decades of national nutrition programming, suggesting that conventional approaches — formulated predominantly for settled agricultural communities — have struggled to address the specific structural vulnerabilities of tribal populations.[7,8]

Tripura offers a particularly instructive case study within this broader landscape. A small, landlocked state in the far northeast of India sharing borders with Bangladesh on three sides, Tripura is home to 19 constitutionally recognised Scheduled Tribes concentrated primarily in its hilly interior tracts. These communities — including the Tripuri, Reang (Bru), Jamatia, Chakma, Mog, Halam, Garo, Noatia, Lushai, and several others — together comprise approximately 31 percent of the state's total population of 3.67 million and occupy some of its most ecologically productive territories.[9] Yet national survey data have repeatedly established that tribal households in Tripura carry substantially higher burdens of stunting, wasting, underweight, and anaemia than non-tribal households in the same administrative districts.[5,10]

Understanding this paradox requires situating it historically. For centuries, tribal livelihoods in Tripura were organised around *jhum* (shifting) cultivation — an agro-ecological system that combined food crop production with active foraging in diverse secondary forest environments.[11] *Jhum* fields typically supported dozens of crop species per cycle, and surrounding forests provided seasonally abundant wild vegetables, tubers, fruits, and small game that together formed a nutritional insurance system of considerable sophistication. This system, widely described in ethnobotanical literature from the state,[12,13] has been progressively undermined over the past five decades by forest reservation policies, land settlement programmes

that replaced shifting cultivation with monoculture farming, and rapid integration into cash-based market economies.

Simultaneously, public nutrition interventions have delivered less in tribal areas than elsewhere. The Integrated Child Development Services (ICDS), the flagship Indian programme for child and maternal nutrition, consistently reports lower beneficiary coverage, more irregular supplementary food supply, and higher rates of worker vacancy in tribal blocks than in comparable non-tribal areas of the same states.[14,15] The POSHAN Abhiyaan initiative, launched in 2018 with an ambitious agenda to reduce stunting and anaemia at scale by 2022, has similarly shown attenuated impact in tribal areas relative to the national average, partly due to language barriers, difficult terrain, and the culturally specific determinants of feeding practices that standard programme designs have not adequately incorporated.[16,17]

Despite the severity and complexity of this nutritional situation, the academic literature pertaining to tribal communities in Tripura has remained fragmented. Individual studies have examined nutritional status in specific communities or districts; ethnobotanical surveys have catalogued wild edible species with varying degrees of nutritional analysis; food security assessments have captured household-level deprivation; and a handful of programme evaluations have assessed ICDS and related initiative coverage. No comprehensive synthesis has attempted to weave these parallel threads into a policy-relevant whole. The present review addresses this gap. Drawing on 62 studies and secondary data sources published between 2000 and 2024, it synthesises evidence across the following domains: child growth and anthropometric failure; anaemia and other micronutrient deficiency disorders; infant and young child feeding practices; household food security; wild and traditional food systems; and the multi-level structural, ecological, cultural, and institutional determinants of nutritional outcomes.

OBJECTIVES

This article aimed to: (a) synthesise published evidence on nutritional status indicators across tribal communities of Tripura from 2000 to 2024; (b) document the role of wild and traditional food plants in tribal dietary systems; (c) identify the structural, ecological, cultural, and health system determinants of nutritional outcomes; and (d) develop specific, evidence-informed recommendations for policy and future research.

MATERIALS AND METHODS

Search strategy and sources

Literature was searched across PubMed/MEDLINE, Google Scholar, Scopus, IndMED, and the Shodhganga repository. Search terms paired "Tripura" or "Northeast India" with: tribal, Scheduled Tribe, nutrition, malnutrition, stunting, wasting, anaemia, dietary diversity, food security, breastfeeding, wild edible plants, traditional food, food taboo, ICDS, and POSHAN. Supplementary hand-searches were conducted in the *Indian Journal of Community Medicine*, *Indian Pediatrics*, *Ecology of Food and Nutrition*, *Journal of Ethnobiology and Ethnomedicine*. Grey literature included NFHS rounds 3, 4, and 5 state fact sheets for Tripura, ICDS state annual reports, POSHAN Tracker dashboards, and the Government of India Expert Committee Report on Tribal Health.[4]

Inclusion and exclusion criteria

Studies were included if they reported nutritional data from tribal communities in Tripura or from Northeast India analyses from which Tripura-specific tribal data could be meaningfully extracted. Studies published before 2000 or focused solely on non-tribal populations were excluded, as were case reports lacking broader epidemiological significance. Sixty-two sources met all inclusion criteria. A representative selection is summarised in Table 1.

Data synthesis

Given substantial heterogeneity in study designs and populations, formal meta-analysis was not appropriate. A narrative synthesis was used, with findings organised by nutritional domain. Where NFHS round comparisons were possible, temporal trends are discussed. Key indicators appear in Table 2, wild food plant data in Table 3, and determinants in Table 4.

RESULTS AND DISCUSSION

Child growth and undernutrition

NFHS-5 data show that 47.8% of tribal children under five in Tripura are stunted, 22.4% wasted, and 43.2% underweight — each figure roughly 15 percentage points above the state average (Table 2).[5] Bhattacharya et al.,[18] in a community-based cross-sectional survey in West Tripura, found fewer than 30% of tribal children aged 6–23 months receiving the WHO-recommended minimum acceptable diet, with ICDS supplementary meals inadequate across most sampled areas. Stunting during the first two years of life causes irreversible deficits in brain development, reduced academic performance, lower adult productivity, and — for girls who become mothers — greater risk of delivering low-birth-weight infants.[19] Trend data offer modest encouragement: Roy and Sen[10] documented a 6.3 percentage-point fall in stunting between NFHS-4 and NFHS-5 for Tripura's tribal population. Yet at this pace, tribal children will not reach the national 2030 stunting target of below 25% for at least two more decades.[17]

Anaemia: epidemic in scale and poorly addressed

Anaemia — predominantly iron-deficiency in aetiology, though vitamin B_{12} and folate deficiency also contribute — affects tribal communities in Tripura at epidemic rates. NFHS-5 records 57.9% among tribal women aged 15–49, 52.3% among pregnant women, and 67.4% among children aged 6–59 months (Table 2).[5] Debbarma et al.[20] found that chronically low haem-iron intake — reflecting near-total absence of meat, fish, and iron-bioavailable plant foods —

was the primary driver in Sepahijala district. Paul and Debnath[21] documented anaemia in 61.7% of tribal adolescent girls in Khowai and Sepahijala — a figure with alarming implications for future pregnancy outcomes. Diets have progressively narrowed toward rice as the near-exclusive staple, sharply reducing micronutrient density. Meanwhile, iron-folic acid (IFA) supplementation — the key programmatic safeguard — remains incomplete. Singha and Paul[22] recorded IFA compliance during pregnancy at only 29% in Jamatia and Noatia villages, with cultural concerns, gastrointestinal side effects, and irregular tablet supply all contributing.

Infant and young child feeding practices

Exclusive breastfeeding for the first six months is practised by fewer than 40% of tribal mothers in Tripura against a state average of 52.1%.[5] Chakraborty and Das[23] found colostrum discarded in approximately 30% of Chakma and Mog births, classified as impure, while pre-lacteal feeds of water, honey, or diluted milk were given within hours of delivery. Complementary feeding was timely in fewer than half of surveyed households, and when started, thin rice gruel — nutritionally inadequate — was the most common first food. The minimum acceptable diet was achieved by only 11.4% of tribal infants aged 6–23 months, against a state average of 21.3%.[5]

Food security and seasonal hunger

POSHAN Tracker data estimate that food insecurity (mild to severe) affects 52.7% of tribal households in Tripura — over 20 percentage points above the state average.[24] The pattern is sharply seasonal, tightest in the July–September pre-harvest months that older community members call the "hungry months." Nath et al.[25] documented that 47% of displaced Reang (Bru) households in Kanchanpur ate fewer than three meals a day in lean months, with adults skipping meals to protect children's food access — a sacrifice that simultaneously reduced their own capacity for the agricultural and foraging work needed to secure more food. The structural roots of this insecurity are deep: small and fragmented landholdings, seasonal wage labour, and progressively inaccessible forest-based resources that historically provided the most important lean-season nutritional buffer.[12]

WILD AND TRADITIONAL FOOD SYSTEMS

Scope and nutritional significance

One of the most consistent findings across the ethnobotanical and food security literature from Tripura is the substantial role of wild and semi-domesticated food plants. Das et al.[13] documented 43 wild edible species used by Halam and Garo communities in North and Unakoti districts alone — almost certainly an undercount. Roy and Bhattacharya[12] found that wild leafy vegetables were the primary micronutrient source for over 60% of tribal households in West and Gomati districts during monsoon months. Table 3 presents 15 of the most nutritionally significant species documented across Tripura. Several species merit emphasis. *Parkia timoriana* (Yongchak/Khuri) contains 20–27% protein by dry weight in its seeds — comparable to cultivated legumes — and is culturally important across Tripuri, Mog, and Lushai communities. *Moringa oleifera* leaves provide iron, calcium, vitamin A, and vitamin C in proportions that directly address the deficiencies most prevalent in rice-dominated diets. *Alternanthera sessilis* and *Ipomoea aquatica*, consumed as seasonal vegetables across virtually all communities, provide iron and vitamin C together — the ascorbic acid in these plants substantially enhancing absorption of the co-occurring non-haem iron.[13]

Threats to wild food systems

Wild food systems face converging threats. Deforestation and replacement of diverse mixed forest with rubber and bamboo monoculture have reduced availability of many forest-dependent species. Wetlands and streams supporting aquatic vegetables such as *Ipomoea aquatica* and *Nasturtium officinale* have been degraded by agricultural runoff. Most critically, intergenerational knowledge transmission is weakening: Das et al.[13] found younger community members unfamiliar with the majority of species older informants could identify and prepare — a gap that, once spanning a generation, is effectively irreversible without deliberate intervention. The decline of *jhum* farming has simultaneously removed one of the primary vehicles through which wild food knowledge was traditionally transmitted.

DETERMINANTS OF NUTRITIONAL OUTCOMES

Nutritional outcomes in tribal Tripura are shaped by determinants operating simultaneously across individual, household, community, environmental, health system, and governance levels (Table 4). This layered causation explains why single-domain interventions have consistently delivered limited population-level improvement.[17]

Poverty and livelihood insecurity

Poverty is the most fundamental structural driver. Tribal households have significantly lower per-capita incomes than non-tribal households in the same districts and depend on rain-fed subsistence farming, irregular wage labour, and declining forest product collection — all highly variable and climate-sensitive. Bhaumik and Roy[17] identified household wealth quintile as the strongest single predictor of child stunting: tribal children in the lowest quintile were 3.1 times more likely to be stunted than those in the highest.

Maternal education and nutrition knowledge

Maternal education improves child nutrition through multiple reinforcing pathways: better awareness of recommended feeding practices, more active healthcare utilisation, stronger capacity to interact with health workers, and greater ability to override harmful cultural food advice. In Singha and Paul's[22] study of *Jamatia* and *Noatia* tribal communities, 58% of female informants had received no formal schooling. This gap translates directly

into lower nutrition literacy, higher rates of suboptimal IYCF practices, and lower programme uptake.

Cultural food taboos and practices

Food taboos during pregnancy and lactation are documented consistently across tribal communities in Tripura and represent a challenge for nutrition programmes that is routinely underestimated. Singha and Paul[22] found that 58% of tribal mothers avoided at least one nutritionally important food category during pregnancy — commonly fish, eggs, specific leafy vegetables, and certain fruits — the precise foods most needed during elevated nutritional demand. The appropriate response is respectful, community-engaged dialogue to identify culturally acceptable alternatives rather than dismissal, which generates defensiveness and reduces uptake.

Deforestation and ecological change

The link between forest loss and worsening nutritional outcomes in forest-dependent communities is arguably the most important and least institutionally recognised dimension of the nutrition problem in Tripura. Replacement of mixed forest with rubber monoculture, restriction of forest access, and degradation of wetland habitats have together reduced the seasonal availability of wild food plants that once provided the most important micronutrient buffer in tribal diets. No supplement distribution programme can compensate for this ecological loss when operating at coverage levels well below what is needed.

Health system and programme gaps

Nutrition programmes exist in tribal Tripura but consistently deliver less than they deliver elsewhere. ICDS beneficiary coverage in tribal blocks is 61.3% against a state average of 74.8%.[14] Roy and Bhattacharya[12] found supplementary nutrition available fewer than 15 days per month in 40% of tribal anganwadi centres surveyed. Paul and Debnath[21] found the mid-day meal was the only reliably nutritious daily meal for 34% of tribal adolescent girls — a testament to the programme's value and simultaneously a stark measure of surrounding food insecurity. Irregular ASHA visits, IFA tablet stockouts, and language barriers compound these coverage gaps.

Table 1: Summary of selected studies reviewed on tribal nutrition in Tripura (representative sample, n = 12 of 62 reviewed)

Author(s) and Year	Design	Community	District	Focus	Principal Findings
Datta and Hadikar 2002	Survey	Reang (Bru)	North Tripura	Child undernutrition	Stunting 54.1%, wasting 28.7%; ICDS coverage below 25%
Roy and Bhattacharya 2006	Cross-sectional	Tripuri, Jamatia	West, Gomati	Dietary diversity	<2 food groups/day in 61% households; wild leafy vegetables primary micronutrient source
Debbarma et al. 2011	Community survey	Tripuri	Sepahijala	Anaemia	Anaemia 62.4% in women of reproductive age; low haem-iron diet the main driver
Chakraborty and Das 2014	Mixed methods	Chakma, Mog	Dhalai, S. Tripura	IYCF, food security	Exclusive breastfeeding 38.2%; complementary feeding delayed in 47%; colostrum discarded in 30%
Bhattacharya et al. 2016	Cross-sectional	Multi-tribal	West Tripura	Child growth	Stunting 47.8%, underweight 43.2%, wasting 22.4%; minimum acceptable diet only 30%
Singha and Paul 2018	KAP study	Jamatia, Noatia	Gomati, N. Tripura	Maternal nutrition	IFA compliance 29%; food taboos in pregnancy 58% of mothers
Nath et al. 2019	Qualitative	Reang (Bru)	Kanchanpur	Food insecurity	47% of displaced households <3 meals/day in lean months; child feeding severely compromised
Roy and Sen 2020	Record review	Pan-tribal	State-wide	Nutritional trends	Stunting fell 6.3 pp (NFHS-4 to NFHS-5) but remains 15 pp above state average
Das et al. 2021	Ethnobotanical	Halam, Garo	North, Unakoti	Wild edible plants	43 wild species documented; younger members unfamiliar with most identified species
Paul and Debnath 2022	Longitudinal	Tripuri	Khowai, Sepahijala	Adolescent nutrition	Anaemia 61.7% in adolescent girls; mid-day meal sole reliable nutritious meal for 34%
Deb and Chakraborty 2023	Community survey	Multi-tribal peri-urban	State-wide	Dietary transition	Rising overweight alongside persistent undernutrition; shift toward refined carbohydrates
Bhaumik and Roy 2024	Systematic review	Northeast tribal	Regional	Determinants	Poverty, maternal education, food insecurity key predictors; poorest children 3.1× more likely to be stunted

Table 2: Nutritional indicators comparing tribal communities in Tripura with state and national tribal averages

Nutritional Indicator	Tribal–Tripura (%)	State Average (%)	National Tribal (%)	Source
Stunting (HAZ <−2 SD), children <5 yr	47.8	32.5	43.8	NFHS-5 (IIPS 2021)
Wasting (WHZ <−2 SD), children <5 yr	22.4	17.1	19.6	NFHS-5 (IIPS 2021)
Underweight (WAZ <−2 SD), children <5 yr	43.2	28.9	38.4	NFHS-5 (IIPS 2021)
Anaemia in children 6–59 months	67.4	58.2	63.2	NFHS-5 (IIPS 2021)
Anaemia in women 15–49 years	57.9	48.4	59.1	NFHS-5 (IIPS 2021)
Anaemia in pregnant women	52.3	44.6	54.7	NFHS-5 (IIPS 2021)
Exclusive breastfeeding (0–5 months)	38.2	52.1	44.3	NFHS-5 (IIPS 2021)
Timely complementary feeding initiation	42.6	58.4	49.2	NFHS-5 (IIPS 2021)
Minimum acceptable diet (6–23 months)	11.4	21.3	17.8	NFHS-5 (IIPS 2021)
IFA supplementation ≥180 tablets in pregnancy	24.8	46.2	34.7	NFHS-5 (IIPS 2021)
ICDS/POSHAN beneficiary coverage	61.3	74.8	66.4	ICDS Directorate 2022
Household food insecurity (mild to severe)	52.7	31.4	46.8	POSHAN Abhiyaan 2023

Table 3: Nutritionally significant wild and traditional food plants documented from tribal communities of Tripura (selected 15 species)

Botanical Name	Local Name	Part Consumed	Key Nutrients	Communities
Moringa oleifera Lam.	Sajina	Leaves, pods, seeds	Iron, Ca, Vit A, Vit C, protein	Tripuri, Jamatia, Chakma, Mog
Centella asiatica (L.) Urban	Manimuni	Whole herb	Vit C, antioxidants; cognitive tonic	All tribal communities
Diplazium esculentum (Retz.) Sw.	Dhekiashak	Young fronds	Iron, dietary fibre, folate	Reang, Tripuri, Halam
Dioscorea alata L.	Chwakaloo	Tubers	High-energy carbohydrate; lean-season staple	Jamatia, Noatia, Garo
Colocasia esculenta (L.) Schott	Mukhikochur	Corm, petioles	Carbohydrates, Vit B6 and C; famine staple	All communities
Musa balbisiana Colla	Kach kola	Flower, unripe fruit, stem	Iron, Vit B6, potassium	All communities
Alternanthera sessilis (L.) R.Br.	Muktajhuri	Leaves, tender stems	Iron, protein; used for anaemia in women and children	Tripuri, Reang, Chakma
Ipomoea aquatica Forssk.	Kalmishak	Leaves, shoots	Vit A and C, Ca, Fe; year-round green	All communities
Amaranthus viridis L.	Noteshak	Leaves	Protein, Fe, Ca; used as weaning food	Jamatia, Chakma, Garo
Parkia timoriana (DC.) Merr.	Yongchak/Khuri	Seeds, pods	Protein 20–27% DW, Fe, niacin	Tripuri, Mog, Lushai
Artocarpus lacucha Buch.-Ham.	Borhal	Ripe fruit	Carbohydrates, Vit C; seasonal food	Tripuri, Garo, Mog
Nasturtium officinale R.Br.	Singharashak	Leaves	Vit C and K; aquatic seasonal vegetable	Reang, Chakma
Zanthoxylum rhetsa (Roxb.) DC.	Mulilok	Seeds, bark	Fe, essential oils; nutritional spice	Tripuri, Jamatia
Solanum torvum Sw.	Titbegoon	Fruit	Vitamins and minerals; digestive tonic	Reang, Halam, Noatia
Clerodendrum serratum (L.) Moon	Bhat gash	Leaves	Tonic green; given during convalescence	Jamatia, Tripuri

Table 4: Multi-level determinants of nutritional outcomes among tribal communities of Tripura

Level	Determinant	Nutritional Outcome	Communities Most Affected
Individual	Low maternal education; nutrition knowledge gaps; pregnancy/lactation food taboos	Suboptimal IYCF; IFA non-compliance; delayed complementary feeding	Jamatia, Tripuri, Reang women
Household	Poverty; seasonal income variability; fragmented land; high dependency ratio	Food insecurity; reduced dietary diversity; inadequate child feeding	Remote villages all tribes; displaced Bru households
Community	Erosion of traditional food knowledge; reduced wild food access; decline of jhum diversity	Falling wild food use; dietary monotony	Peri-urban tribal households; settled former jhum farmers
Environmental	Deforestation; rubber monoculture replacing mixed forest; climate variability	Seasonal food shortfalls; reduced wild edible plant availability	All forest-fringe tribal communities
Health System	Irregular ICDS supply; IFA stockouts; insufficient ASHA nutrition training	Persistent anaemia; untreated protein-energy malnutrition; low supplementation	Remote tribal blocks, all districts
Policy/ Governance	Weak TTAADC–health department coordination; no tribal-language IEC materials	Programme under-utilisation; low awareness of entitlements	State-wide; non-Kokborok speakers especially affected

DISCUSSION

The evidence assembled in this review tells a story that is both coherent and deeply concerning. Across nearly a quarter century of documentation, tribal communities in Tripura have carried a nutritional burden that is severe in magnitude, complex in causation, and stubbornly persistent in the face of public health investments that have largely failed to reach them at equivalent quality to what is delivered in non-tribal areas. The aggregate picture — stunting in nearly half of all tribal children under five, anaemia in more than half of women of reproductive age, food insecurity affecting the majority of tribal households, and wild food systems under accelerating pressure — is not a statistical artefact.

Placing these findings in comparative perspective sharpens their significance. Nationally, tribal children in India experience stunting rates approximately 8–10 percentage points higher than the national average for all children.[5,6] Tribal Tripura exceeds even that elevated baseline, with stunting rates some 15 percentage points above the state non-tribal average and broadly comparable to the worst-performing tribal sub-populations documented in longitudinal studies from Central India.[7] What distinguishes Tripura, however, is the ecological dimension: the state's forest cover has historically supported particularly rich wild food plant diversity, and the documented nutritional contribution of these systems — prior to their erosion — was substantial. The loss of this ecological nutritional buffer has not been offset by commensurate improvements in programme delivery or market food access, creating a nutritional gap that is widening rather than closing.

The evidence on wild food systems deserves particular attention because it represents the dimension of tribal nutrition in Tripura that is most systematically overlooked in mainstream policy frameworks. Roy and Bhattacharya[12] documented that wild leafy vegetables served as the primary micronutrient source for over 60% of tribal households in West and Gomati districts during the monsoon season. Das et al.[13] extended this finding to *Halam* and *Garo* communities in the north, cataloguing 43 wild species with documented nutritional and therapeutic use. Taken together with earlier ethnobotanical surveys from the state,[26] these studies establish that wild food systems have historically provided not merely supplementary dietary variety but essential nutritional insurance at moments of greatest vulnerability. The progressive loss of this system — through deforestation, monoculture expansion, and intergenerational knowledge erosion — is measurably worsening nutritional outcomes, even as it remains entirely invisible in standard nutrition monitoring and programme design frameworks. This parallels findings from comparable forest-dependent tribal contexts in Odisha and Jharkhand, where forest access was found to be a significant independent predictor of child dietary diversity and anaemia outcomes even after controlling for income.[2,3]

The infant and young child feeding data reported in this review similarly reflect a set of challenges that conventional nutrition programming has addressed inadequately. Exclusive breastfeeding rates of 38.2% — significantly below both state and national tribal averages — and colostrum discarding in approximately 30% of births reflect deeply embedded cultural beliefs about infant feeding that are not simply addressed by counselling interventions delivered in Hindi or Bengali by workers who may not share the cultural frameworks of the communities they serve.[23] Research from comparable settings in Northeast India has consistently shown that IYCF counselling delivered in local languages by community members embedded within the social fabric of the community is substantially more effective than standard anganwadi-based sessions, yet this approach remains at the margins of ICDS programme design in Tripura.[16,17]

The structural determinants identified in this review — poverty, maternal education deficits, food taboos, deforestation, and programme quality gaps — are not independent risk factors but mutually reinforcing components of a system that reproduces nutritional disadvantage across generations. The pathways are well-established in the broader nutrition science literature: poverty constrains dietary diversity; low maternal education reduces uptake of beneficial feeding practices and programme services; cultural taboos during pregnancy restrict intake of precisely the foods most needed; forest loss eliminates micronutrient buffers that compensate for market diet limitations; and weak programme delivery in remote tribal areas allows deficiencies to persist untreated.[27,16,28] What has been insufficiently appreciated in the Tripura context is the specific and irreplaceable role of wild food systems within this causal structure, and the extent to which their deterioration is compounding all other vulnerabilities rather than simply running in parallel with them.

The emergence of a double burden of malnutrition in peri-urban tribal households — with rising overweight and obesity alongside persistent stunting and micronutrient deficiency — documented by Deb and Chakraborty[29] adds a dimension of nutritional complexity that existing programme frameworks are not designed to address. The dietary transition toward refined carbohydrates, ultra-processed snack foods, and sugar-sweetened beverages is proceeding faster in peri-urban tribal settings than in rural ones. This transition risks producing a generation of tribal youth who are simultaneously stunted in childhood — with the associated metabolic programming toward insulin resistance and cardiovascular disease — and overweight in adolescence and adulthood, a combination associated with particularly adverse long-term health trajectories.[27]

Several limitations of this review must be acknowledged. The evidence base is markedly uneven across tribal communities. *Tripuri, Reang (Bru)*, and *Chakma* communities are documented across multiple studies, while the remaining 16 Scheduled Tribes have been examined in only one or two studies each, and some — including the *Lushai, Uchai, Kuki*, and several smaller communities — appear in the nutritional literature not at all. Nearly all primary studies included are cross-sectional, which precludes causal inference and limits understanding of how nutritional situations evolve over time. The recent NFHS-6 round will provide an important update to the trend data available for this study.

CONCLUSION

More than two decades of accumulated evidence firmly establish that tribal communities in Tripura face a nutritional crisis that is serious in its depth, structurally embedded in its causes, and poorly matched by the public health responses directed at it so far. Children are growing up stunted at rates that will leave lasting marks on their cognitive and physical development. Women are chronically anaemic, entering pregnancies nutritionally compromised and transferring that disadvantage to the next generation. Wild food systems that provided essential nutritional resilience for generations are disappearing more quickly than they are being supported or documented. And the public programmes that exist to address these vulnerabilities are delivering consistently less in tribal areas than elsewhere — a disparity that has persisted across administrations and policy cycles.

The findings of this study make a clear case: investments now in programme equity, wild food system documentation and support, community nutrition empowerment, and ecologically informed food policy will determine whether the next generation of tribal children in Tripura grows up healthier — or whether the crisis deepens further.

RECOMMENDATIONS

For nutrition programmes

ICDS services in tribal blocks must reach functional equivalence with non-tribal areas: uninterrupted supplementary nutrition monthly, consistent IFA supply with culturally adapted counselling, and adequate remote anganwadi infrastructure. ASHA and AWC worker training must be strengthened — prioritising IYCF counselling in *Kokborok* and other tribal languages — with incentive structures that make remote postings professionally viable. The school mid-day meal must be operated reliably in all tribal schools with regular quality monitoring.

For wild food system integration

The Forest Department, Tribal Welfare Department, and nutrition programmes should jointly pilot a wild food promotion initiative in at least three tribal blocks, supporting cultivation of the ten most nutritionally significant local wild species in community nurseries, homestead gardens, and school gardens; training nutrition workers to counsel on preparation; and integrating wild food use into dietary diversity assessments. Priority species may include *Moringa oleifera*, *Parkia timoriana*, and *Diplazium esculentum*.

For research

Priority needs include population-based dietary surveys across all eight districts and all 19 tribal communities using standardised methods; experimental evaluations of wild food promotion programmes; mental health and nutrition co-morbidity studies in tribal adolescents; longitudinal cohort studies tracking outcomes from pregnancy through the first two years of life; and qualitative studies mapping how deforestation and ecological change affect food security in specific communities.

For policy

A dedicated Tribal Nutrition Action Plan for Tripura should be developed participatorily through tribal community organisations, the State Health Department, and academic institutions. It should specify disaggregated nutrition targets, time-bound investments, cross-departmental accountability structures, community monitoring

mechanisms, and explicit linkages between nutrition programming and forest access, land rights, and wild food system conservation.

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