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Nutritional Health of Tribal Children in India: Bridging Cultural Perceptions and Objective Assessments

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ABSTRACT The assessment of objective data on tribal children's malnutrition has been analysed with subjective interpretations through contextual background information about the cultural beliefs and practices, and environmental determinants in this article. This posits a stand to understand the biomedical perspective encompassing a holistic and humane context. The study uses data from the report of Comprehensive National Nutrition Survey (CNNS), India 2019. Statistically significant differences highlight the greater vulnerability of Scheduled Tribe (ST) children to growth retardation and anaemia compared to other social categories. However, tribal children fare better with vitamin A and D deficiency. While tribal children are more likely to face socioeconomic challenges, they also benefit from diets enriched with wild foods, which enhance their Vitamin A and D levels in contrast to Scheduled Caste (SC) and Other Backward Class (OBC) children. The extensive literature review and discussion indicate the adverse influence of socio-cultural practices and depletion of traditional resources on the health status of tribal children.

INTRODUCTION

Perceiving and Defining Health and Wellbeing

Health and well-being are increasingly recognised as multidimensional constructs encompassing physical conditions and emotional, social, and environmental factors (Christoforou et al. 2024). As societies evolve, so do the definitions and perceptions of what constitutes a good life, with strong individual variations influenced by cultural and contextual dynamics (Willroth et al. 2024). This essay reviews key studies exploring these perceptions, emphasising the interplay between objective health indicators, personal experiences, and environmental contexts to promote better health outcomes.

Evolving Definitions of Health and Well-Being

The traditional biomedical model, which dominated health definitions throughout the twentieth century, is being challenged by a more inclusive perspective that views health as underpinning adaptability, functionality, and emotional well-being (World Health Organization 1946; Christoforou et al. 2024). This shift is accompanied by diverse individual definitions of health and well-being, as illustrated by Christoforou et al. (2024), who identify four distinct perception groups of those who see health and well-being as interdependent, those viewing them as unrelated, those who recognise their mutual influence, and those perceiving health as an entirely separate domain.

This nuanced understanding is further emphasised by Willroth et al. (2024), who highlight age and cultural differences in perceptions of a good life. Factors such as familial relationships and career success gain varying importance across different stages of life, revealing the complexity of subjective experiences.

Influence of Environmental Contexts

An emerging theme across studies is the significant role of the built environment in shaping health perceptions. As noted by Christoforou et al. (2024), aspects like aesthetics, functionality, social engagement, and stress levels strongly correlate with well-being, pointing to the underexplored environmental determinants of health.

Harmonising these findings, Tanaka et al. (2020) establish a link between lifestyle factors and subjective health, confirming that positive lifestyle behaviours, including regular exercise, considerably improve self-perceived health (SPH). This

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underscores the importance of contextual factors in enhancing individual perceptions of health.

The Interplay of Objective Health Indicators and Personal Well-being

Research reveals that objective health indicators such as chronic illnesses, psychological well-being, and lifestyle choices directly influence SPH. For instance, Gumà's (2021) study demonstrates the varying predictive power of health indicators based on age, with chronic diseases impacting younger individuals more significantly, while activities of daily living (ADL) limitations become paramount in older adults. Furthermore, Syed et al. (2024) emphasise the significant relationship between illness perception and physical activity adherence among patients with non-communicable diseases (NCDs), showcasing the necessity of understanding personal perceptions in health promotion.

Similarly, Leite et al. (2019) found that positive health perceptions contribute notably to psychological well-being, suggesting a bidirectional relationship. This correlates with Ruggeri et al. (2020), who advocate for a multidimensional view of well-being comprising both hedonic and eudaimonic elements across diverse populations.

Cultural Variations in Health Perceptions

Understanding regional and cultural influences on health perceptions is essential. Maniscalco et al. (2020) and Silva et al. (2021) provide insight into how socioeconomic contexts contribute to variations in self-perceived health, particularly among older adults in Italy, Greece, and Spain. Hence, tailored health promotion strategies, considering local cultural norms and socioeconomic factors, are warranted.

Furthermore, Memon et al. (2018) illustrate the multifaceted nature of well-being by highlighting everyday experiences that contribute to subjective interpretations, such as social interactions and personal purpose. These findings reinforce that well-being transcends traditional health metrics, encompassing a larger spectrum of human experience.

Bautista-Valarezo et al. (2020) have noticed that the indigenous healers in southern Ecuador view health holistically, encompassing physical, emotional, spiritual, and social well-being. They emphasise balance and harmony within the individual and their community. This "balance" includes a harmonious relationship with nature and the community, achieved through a good diet and peaceful interactions. Health is also seen as a gift from God, enabling productivity and community contribution (Health as God's blessing or a gift section).

Implications for Policy and Interventions

The collective insights from these studies call for a shift from simplistic health definitions towards comprehensive frameworks that incorporate subjective, objective, and environmental aspects of health. Future research should focus on developing culturally sensitive interventions that cater to varied demographic and environmental contexts.

Interventions aimed at enhancing health perceptions must not only address objective health factors but also incorporate subjective elements such as emotional well-being and environmental quality. Collaborative efforts between healthcare providers, urban planners, and policymakers are crucial in creating environments conducive to improved health perceptions and overall well-being.

Health Status of Indigenous and Tribal Children

Sociocultural Perception of Children in Tribal Societies

Cultural beliefs are crucial in shaping healthcare perspectives and child health in tribal societies. For example, among the !Kung San of Southern Africa, childbirth is a spiritual event connecting families to ancestral spirits, with significant community involvement (Wober 2014). In the Hopi tribe, births are essential for family lineage and community prosperity, often celebrated with ceremonies (Dêbska n.d.). In India, the Gond community also incorporates rituals connecting births to ancestral spirits (Kumar and Baudh 2021:764). Similarly, the Santhal tribe performs certain rituals to protect newborns from evil spirits (Gaur et al. 2024:3152). These practices emphasise that children's survival is vital for cultural continuity and identity. Traditional lifestyles directly influence children's health. For instance, the Inuit community emphasises imparting essential survival skills early in life (Findlay and Janz 2006), while the Bhil tribe teaches children foraging skills for sustenance (Sahare et al. 2021).

Perceiving Health, Illness, and Treatment Among Indigenous and Tribal People

Maher (1999) presented a framework for understanding traditional health beliefs, acknowledging the diversity within Aboriginal cultures and emphasising that this is a general guide rather than a rigid categorisation. The author considered diverse aspects of the traditional health beliefs and practices of Australian Aborigines that he encountered in the reviewed literature. Broadly, most indigenous and tribal societies follow at least some of the practices classified and analysed in the framework, especially those living in rural settings.

The author identifies the "Natural Causes of Illness" that are considered relatively minor and temporary, arising from factors within the individual or their immediate environment, such as emotional factors, dietary factors, and physical injury or assault. Under environmental causes of illness, the author classifies illnesses attributed to environmental influences beyond the individual's immediate control, such as weather conditions and other environmental factors. Under the supernatural causes of illness (direct intervention), the author includes those illnesses perceived as serious that are directly linked to breaches of customary laws and taboos. The author emphasises that there are also supernatural causes of illness (indirect intervention) attributed to the actions of others, specifically involving sorcery or other forms of indirect supernatural influence. Emphasising medical pluralism in traditional domains, the author classifies some illnesses as relatively recent introductions due to colonisation and westernisation, and are not traditionally part of the existing Aboriginal health belief system.

Kahissay et al.'s (2017) study in rural northeastern Ethiopia reveals that a community's understanding of ill-health causation incorporates supernatural entities such as God/Allah, spirits of nature and human agents, natural human interactions such as environmental sanitation, hygiene, biological factors, poverty, and societal phenomena such as social norms, family support, violation of taboo.

The Synthesis of Health Perceptions and Treatment Seeking Among Indian Tribes

Health perceptions and causal understandings of illness among tribal communities reveal a rich tapestry of beliefs shaped by cultural, social, and economic contexts. Firstly, tribal and indigenous societies mostly perceive health holistically, integrating their lifeworld's material and non-material aspects, contrasting with more reductionist biomedical models. Tribal people often define their health status based on their ability or inability to perform daily activities (Mishra and Sarma 2011; Raj and Nayak 2018). This perspective of perceiving the health and well-being of tribal people suggests a need to understand health among tribes as a broader phenomenon encompassing mental and spiritual wellness. This important aspect of perceiving health among tribes is often overlooked in conventional healthcare frameworks.

Moreover, relating supernatural forces, environmental conditions, or social transgressions as the causes of illness and ailment makes tribal health studies a unique subject for inquiry (Jangir 2017; Venkatramana and Latheef 2019). This relation significantly influences the way people seek better health, alienating biomedical explanations of illness and cure from the traditional tribal domain to a great extent. Based on such understanding and meaning, tribal people often perceive traditional healing practices as more culturally relevant and trustworthy than modern medical alternatives (Gandhi et al. 2017). Mishra and Sarma (2011) observed that the perception of the severity of an illness and the trust placed in various healers determine the treatment-seeking behaviour of people. The traditional treatment method becomes more viable if socio-economic factors are linked with these (Prasad and Raushan 2019; Dhanjal and Sharma 2022; Vani 2024). Further, lack of access to transportation, financial limitations, and the perceived insensitivity of healthcare providers deter access and utilisation of biomedical services (Hardiman and Raje 2008; Sahoo et al. 2023). As a result, many individuals may forgo modern treatments entirely, believing that the culturally enriched traditional methods offer a more holistic solution to their health challenges (Tripathi et al. 2024).

Furthermore, the trend in medical pluralism is not uniform across tribal domains. In more accessible areas, one can see an increased trend in utilising biomedical options (Taraphdar et al. 2022). Conversely, in inaccessible areas, one can see a persistent adherence to traditional methods, especially when cultural beliefs are still strong in the community (Sonowal and Konch 2021).

Health Status of Children Among Indigenous and Tribal Population

With a consistent prevalence of undernutrition, including stunting, underweight, and wasting, the health status of tribal children reveals significant disparities (de Onis et al. 2004; Cole and Lobstein 2012) with non-tribal children. For instance, indigenous children in Brazil exhibit elevated rates of undernutrition compared to national averages, as Horta et al. (2013) highlighted. Factors like poverty limit access to nutritious food, healthcare, and sanitation, leading to compounded health issues. Maternal health is also a crucial factor for child health since maternal anaemia is linked to increased risks of being underweight and stunting among children. The study of Manjong et al. (2020) in developing countries, Zakaria et al. (2019) in Brazil, India, Guatemala, and Malaysia, and Batal (2022) in Canada noted the complex interplay of socioeconomic conditions and cultural contexts and historical dispossession affecting child nutrition, and have identified almost similar situations.

Research by Reyes-García et al. (2018) established that environmental changes impact dietary practices among indigenous societies. In Ecuador, Rivadeneira et al. (2022) reported a staggering 51.6 percent prevalence of chronic malnutrition among Kichwa indigenous children, underscoring the significance of socioeconomic factors, healthcare access, and maternal characteristics in determining nutritional status. Browne et al. (2020) found that effective food policies for indigenous peoples depend on community-driven, culturally relevant approaches to improving nutrition outcomes, even in developed nations. Williams et al. (2023) indicated high rates of childhood obesity in indigenous Australians, calling for culturally safe interventions due to historical disadvantages and limited access to healthy food.

Studies conducted in India by researchers such as Bilquis et al. (2020), Chandra et al. (2021), Dey and Bisai (2019), and Kumar et al. (2024) reveal high rates of chronic malnutrition among tribal children, driven by factors like maternal education, food insecurity, and healthcare access. The studies of Jaiswal (2023), Das et al. (2023), Dhanjal and Sharma (2022), and Dey and Bisai (2019) corroborate these findings, illustrating the influence of factors such as traditional health perceptions and socioeconomic dynamics on indigenous children's nutritional outcomes.

Riyadi et al. (2021) revealed the presence of significant disparities in nutritional intake and health status between Closed and Opened Samin communities. Gracey (2007), Burns and Thomson (2008), and Browne et al. (2020) identified various sociocultural and socioeconomic factors affecting a child's nutritional status. They advocated addressing the social disadvantages faced by indigenous populations through better housing and healthcare access to mitigate children's growth faltering. Similarly, research by Philip et al. (2015) and Saravanakumar et al. (2022) pointed out the critical prevalence of undernutrition among tribal preschool children in India, calling for targeted interventions that focus on nutritional education and healthcare utilisation.

Jaleel et al. (2023) highlighted the critical issue of the triple burden of malnutrition faced by indigenous populations in Kerala and advocated for culturally appropriate, community-led nutritional interventions. Additionally, studies like those from Singh et al. (2015) and Bhagat (2021) reiterated the links between household food insecurity and malnutrition, demonstrating the need for comprehensive approaches to address the multifaceted issues affecting indigenous and tribal children's health. Similar findings are also evident in the review article of Satheesh and Gangadhar (2024) on Indian tribal children, Rajan and Thanikasalam's study (2021) in the Western Ghats of Tamil Nadu, Manjegowda et al.'s (2024) study in Karnataka, Krishna and Srijayanth's study (2022) in Kerala, Khadse and Chaurasia's study (2020), and Jeyakumar et al.'s study (2021) in Maharashtra.

Rationale of the Study

The discussion above clearly indicates that many subjective aspects, such as social and cultural perceptions, beliefs and practices, socio-economic conditions, and environmental conditions, influence the health, especially the nutritional health, of tribal children. These subjective aspects are significant in the case of tribes and indigenous people since they are intimately attached to these aspects. A comparison of health outcomes among various social categories with those of ST children will establish the significant influence of these subjective entities, which otherwise are poorly considered in health studies.

Objective of the Study

The study aims to discuss the extent of malnutrition among tribal children compared to other social categories in India and to relate it to the subjective aspects of health perceptions and practices among tribal societies.

METHODOLOGY

Data Sources and Methods

The numerical data on child nutritional health were taken from the report of the Comprehensive Nutrition and Health Survey, India (CNNS 2016-2018). Specific tables that indicated stunting, wasting, and underweight among children were selected, and the specific numbers and percentages were classified into four social categories of SC, ST, OBC, and Others. Besides these measurements, data on anaemia and micronutrient deficiency in vitamins A and D were also selected. Further, extensive literature on health perception and treatment-seeking behaviour, food habits, and sociocultural traditions related to these aspects was collected.

The data were tabulated according to the study's requirements, and chi-square tests were performed to assess the significant difference in the incidence of nutritional and micronutrient deficiencies between the ST children and the children of the other three social categories. Information from extensive literature reviews explained the causes and probability of deficiencies and differences.

RESULTS

Malnutrition Among Children Aged 0-4 Across Social Categories

Table 1 shows that overall, the percentage of stunting children (0-4) across the social categories in India is significantly high. The mean Z-scores for all categories of children are in negative numbers and over -1. Among all social categories, the ST communities have more severely malnourished children (below -3SD) at 16.1 percent followed by SC, OBC, and Others, respectively. Besides, 41.5 percent of tribal children between the ages of 0-4 years are moderately malnourished (-2SD). SC, OBC, and Others follow this figure.

The chi-square test was performed to see whether there was a significant difference in malnourished children between the ST community and other social categories, such as SC, OBC, and Oth-

Table 1: Prevalence of stunting (height-for-age) children aged 0-4 among social categories in India

Social categories	*Percentage of stunting (height-for-age) children*		*Mean Z -score*	*Weighted number*
	Severely stunted below (-3SD)	*Moderately stunted below (-2SD)*		
SC	15.6	39.3	-1.6	8329
ST	16.1	41.5	-1.6	4690
OBC	13.0	34.8	-1.4	14276
Others	9.6	26.8	-1.2	8935

Source: Comprehensive National Nutritional Survey 2016-2018, (Table 5.3, P. 122)

Table 1(a): Results of the χ^2 test on the significance of differences in the prevalence of stunting children aged 1-4 across social categories

Social categories compared	*Below -3SD*				*Below -2SD*			
	χ^2 statistic	*(df)*	*Critical value (á = 0.05)*	*Inferences*	*χ^2 statistic*	*(df)*	*Critical value (α = 0.05)*	*Inferences*
ST vs SC	103.88	1	3.841	Significant	305.90	1	3.841	Significant
ST vs OBC	50.88	1	3.841	Significant	419.25	1	3.841	Significant
ST vs Other	112.09	1	3.841	Significant	433.49	1	3.841	Significant

Source: Calculated by the author

ers. The observed and expected values were calculated from the total weighted numbers and the percentages in the tables. Table 1(a) shows the results of the chi-square test.

The result shows that the difference between ST children and each of the social categories mentioned in the table in all measures remains statistically significant. Since the percentage share of tribal children is always higher than all other social categories in below-3SD and below-2SD categories, the test signifies that the likelihood of tribal children being prone to severe and mild malnutrition is always higher.

Table 2 reveals that, as per percentage share, a more significant percentage of ST children are prone to severe wasting. Similarly, in moderately wasting children, the percentage share of ST children is higher than that of all other social categories.

A chi-square test was performed to determine the statistical significance of the differences. The observed and expected values were calculated based on the percentages and weighted numbers in CNNS 2016-2018. Table 2(a) shows the observed differences in the nutritional status of tribal children with SC, OBC, and Other communities based on weight-for-height measurements.

The result shows that the difference between ST children and each of the social categories mentioned in the table remains statistically significant. Since the percentage share of tribal children is always higher than all other social categories in the below-3SD and below-2SD categories, the test signifies that the likelihood of tribal children being prone to severe and mild malnutrition is always higher.

Table 3 reveals that the percentage share of underweight children in the age group of 0-4 is highest among ST children compared to all other social categories.

The observed and expected values were calculated using the percentages and weighted numbers in CNNS 2016-2018 to conduct the chi-square test. When comparing the nutritional status of tribal children with SC, OBC, and Other communities based on weight-for-age measurements, the following is observed, as shown in Table 3(a).

Table 3(a) shows that the chi-square statistic is always much greater than the critical value of 3.841, indicating a significant difference between Schedule Tribes and other social categories regarding the incidence of severe and mild underweight among children. Since the percentage dis-

Table 2: Prevalence of wasted (weight-for-height) children aged 0-4 among social categories in India

Social categories	*Percentage of wasted (weight-for-height) children*			*Mean Z -score*	*Weighted number*
	Severely wasted below -3SD	*Moderately wasted below -2SD*	*Overweight above +2SD*		
SC	4.6	16.1	1.5	-1.0	8255
ST	6.9	21.9	1.8	-1.1	4642
OBC	4.5	17.1	1.2	-1.0	14112
Others	4.9	16.5	2.1	-0.9	8776

Source: Comprehensive National Nutritional Survey 2016-2018, (Table 5.3, P. 122)

Table 2(a): Significance of differences in the prevalence of wasted children across social categories

Social categories compared	*Below -3SD*				*Below -2SD*			
	χ^2 statistic	*(df)*	*Critical value (α = 0.05)*	*Inferences*	*χ^2 statistic*	*(df)*	*Critical value (α = 0.05)*	*Inferences*
ST vs SC	103.88	1	3.841	Significant	305.90	1	3.841	Significant
ST vs SC	87.10	1	3.841	Significant	76.51	1	3.841	Significant
ST vs OBC	74.47	1	3.841	Significant	102.17	1	3.841	Significant
ST vs Other	88.65	1	3.841	Significant	91.50	1	3.841	Significant

Source: Calculated by the author.

Table 3: Prevalence of underweight (weight-for-age) children aged 0-4 among social categories in India

Social categories	*Percentage of stunting (height-for-age) children*		*Mean Z -score*	*Weighted number*
	Severely stunted below (-3SD)	*Moderately stunted below (-2SD)*		
SC	11.1	36.1	-1.6	8370
ST	13.5	41.5	-1.7	4749
OBC	9.8	33.1	-1.5	14413
Others	8.0	27.2	-1.3	9001

Source: Comprehensive National Nutritional Survey 2016-2018, (Table 5.3, P. 122)

Table 3(a): χ^2 test results on the significance of differences in the prevalence of underweight children across social categories

Social categories compared	*Below -3SD*				*Below -2SD*			
	χ^2 statistic	*(df)*	*Critical value (α = 0.05)*	*Inferences*	*χ^2 statistic*	*(df)*	*Critical value (α= 0.05)*	*Inferences*
ST vs SC	75.812	1	3.841	Significant	237.300	1	3.841	Significant
ST vs OBC	68.455	1	3.841	Significant	258.762	1	3.841	Significant
ST vs Other	80.64	1	3.841	Significant	176.951	1	3.841	Significant

Source: Calculated by the author

tribution of tribal children in the said categories is always higher than all other social categories, the likelihood that tribal children become prone to malnutrition is significantly greater.

Malnutrition Among Children Aged 5-9 Across Social Categories

Table 4 shows that the percentage of severely stunted children aged 5-9 is highest among SC (6.8%), closely followed by ST (6.4%). Other communities show lower rates of 5.0 percent and 4.7 percent. However, the highest percentage of moderately stunted children is found in ST (26.5%), followed by SC (24.6%), with OBC and Other communities at 20 percent.

The chi-square test was performed to see whether there was a significant difference in stunting children between the ST community and other social categories, such as SC, OBC, and Others. The observed and expected values were calculated from the total weighted numbers and the percentages in the tables. The chi-square test result can be presented in the following table, as shown in Table 4(a).

Table 4(a) reveals that the calculated chi-square statistic for all comparison pairs is much higher than the critical value of 3.841, indicating a significant difference between ST and all other social categories regarding stunting. Since the percentage share of tribal children in the below-3SD and below-2SD categories is always higher than all oth-

Table 4: Prevalence of stunting (height-for-age) children aged 5-9 among social categories in India

Social categories	*Percentage of stunting children (height-for-age)*		*Mean Z -score*	*Weighted number*
	Severely stunted below (-3SD)	*Moderately stunted below (-2SD)*		
SC	6.8	24.6	-1.2	8431
ST	6.4	26.5	-1.3	4827
OBC	5.0	20.0	-1.0	14685
Others	4.7	19.9	-1.0	9046

Source: Comprehensive National Nutritional Survey 2016-2018, (Table 5.11, P. 136)

Table 4(a): χ^2 test results on the significance of differences in the prevalence of stunting children aged 5-9 across social categories

Social categories compared	*Below -3SD*				*Below -2SD*			
	χ^2 statistic	*(df)*	*Critical value (α = 0.05)*	*Inferences*	*χ^2 statistic*	*(df)*	*Critical value (α = 0.05)*	*Inferences*
ST vs SC	75.812	1	3.841	Significant	237.300	1	3.841	Significant
ST vs OBC	68.455	1	3.841	Significant	258.762	1	3.841	Significant
ST vs Other	80.64	1	3.841	Significant	176.951	1	3.841	Significant

Source: Calculated by the author

er social categories, the likelihood of tribal children suffering from stunting is significantly high.

Table 5 also reveals that the percentage of severely underweight children is slightly higher among ST (12.3%) compared to SC (12%) and much higher than that of the OBC and Other communities (around 9%). In the case of mild underweight, the percentage of tribal children is also higher than that of all other social categories.

Table 5(a) shows the statistical significance of the difference in the prevalence of underweight children across social categories in the age group 5-9 years. It makes clear that the difference between ST and OBC children is not significant in terms of the prevalence of underweight in both categories. Mild underweight is also insignificant among ST and Other community children. Overall, the difference between the critical value and the chi-square statistic is much smaller compared to the above-mentioned areas.

Table 6 indicates that severely undernourished children are most common among ST (5.3%), followed by Others (5%). Moderately undernourished children are predominantly from the ST (24.9%), followed by SC (23.9%), OBC (22.8%), and Others (21.5%).

A chi-square test was performed to see whether there was a significant difference in malnour-

Table 5: Prevalence of underweight (Weight-for-age) children aged 5-9 among social categories in India

Social categories	*Percentage of underweight (weight-for-age) children*		*Mean Z -score*	*Weighted number*
	Severely stunted below (-3SD)	*Moderately stunted below (-2SD)*		
SC	12.0	38.3	-1.2	8436
ST	12.3	41.3	-1.3	4809
OBC	9.0	33.4	-1.1	14686
Others	8.7	31.9	-1.0	9024

Source: Comprehensive National Nutritional Survey 2016-2018, (Table 5.11, P. 136)

Table 5(a): χ^2 test results and inferences for children aged 5-9 classified as underweight according to weight-for-age (<-3SD, <-2SD)

Social categories compared	*Below -3SD*				*Below -2SD*			
	χ^2 statistic	*(df)*	*Critical value (α = 0.05)*	*Inferences*	*χ^2 statistic*	*(df)*	*Critical value (α = 0.05)*	*Inferences*
ST vs SC	28.235	1	3.841	Significant	5.45	1	3.841	Significant
ST vs OBC	0.0547	1	3.841	Not significant	0.54365	1	3.841	Not significant
ST vs Other	26.215	1	3.841	Significant	0.5539	1	3.841	Not significant

Source: Calculated by the author

Table 6: Prevalence of malnourished children (BMI-for-age) aged 5-9 among social categories in India

Social categories	*Percentage of malnourished children (BMI-for-age)*				*Mean Z -score*	*Weighted number*
	Percentage below -3SD	*Percentage below -2SD*	*Percentage above +1SD*	*Percentage above +2SD*		
SC	4.9	23.9	3.1	1.1	-1.3	8348
ST	5.3	24.9	2.8	1.1	-1.3	4771
OBC	4.6	22.8	3.6	1.3	-1.2	14856
Others	5.0	21.5	5.1	1.8	-1.1	8974

Source: Comprehensive National Nutritional Survey 2016-2018, (Table 5.13, P. 140)

ished children based on BMI-for-age of the children of ST communities and other social categories, such as SC, OBC, and Others. The observed and expected values were calculated from the total weighted numbers and the table percentages. Table 6(a) shows the chi-square test results. It indicates that the difference in the BMI-for-age incidence is insignificant among children of ST and other social categories.

Anaemia as a Health Concern for Children

Anaemia, characterised by low haemoglobin (Hb) levels, poses significant risks to the health and development of children and adolescents. It negatively impacts psychomotor and brain development, leading to weakness, fatigue, and increased infection rates. Low haemoglobin can result from inadequate micronutrient intake (iron, folate, vitamin B12), parasitic infections, genetic conditions (thalassaemia, sickle cell disease), chronic infections, and diseases such as renal failure (Balarajan et al. 2011; Black et al. 2013; WHO 2017). The WHO, in its guideline (2011), suggested some reference points for diagnosing anaemia based on haemoglobin levels specific to certain age groups. According to this guideline, when the level of haemoglobin is less than 11.0 g/dl in the age group of 1-4 and less than 11.5 g/dl in the age group of 5- 11, they are diagnosed as anaemic. Among the anaemic, ranging between 10.0 and 10.9 g/dl for the 1-4 age group and 11.0 and 11.4 g/dl in the 5-11 years age group, are classified as mild anaemic. Moderate anaemia is assigned to the 1-4 age group, containing 7.0-9.9 g/dl, and to the 5-11 age group, containing 8.0-10.9 g/dl. Less than 7 g/dl in the 1-4 age group and less than 8 g/dl in the 5-11 age group are diagnosed as severe anaemia.

Further, the Department of Nutrition for Health and Development, World Health Organization, 2011, has prepared a chart on the Public Health Significance of Anaemia Prevalence. It states that there is no public health concern when there are up to 5 percent anaemic people in the population. It is a cause of mild public health concern if the population is anaemic, between five and 19.9 percent. A moderate public health concern arises if the population harbours 20 to 39.9 percent of anaemic persons. A population above 40 percent anaemic persons is a severe public health concern.

Table 6(a): χ^2 test results of the prevalence of malnourished children aged 5–9 classified according to BMI-for-age (<-3SD, <-2SD

Social categories compared	*Below -3SD*				*Below -2SD*			
	χ^2 statistic	*(df)*	*Critical value (α = 0.05)*	*Inferences*	*χ^2 statistic*	*(df)*	*Critical value (α = 0.05)*	*Inferences*
ST vs SC	0.518208	1	3.841	Not significant	0.07687	1	3.841	Not significant
ST vs OBC	0.0002127	1	3.841	Not significant	0.07223	1	3.841	Not significant
ST vs Other	0.009649	1	3.841	Not significant	0.07349	1	3.841	Not significant

Source: Calculated by the author.

Prevalence of Anaemia Among Children Across Social Categories

Anaemia Among Children Aged 1-4

As stated above, the prevalence of any anaemia greater than 40 percent is a severe public health problem. Table 7 shows that ST children exceed this threshold by 13.1 percent, while SC exceeds it by 3.7 percent. ST children consistently have higher percentages of all levels of anaemia compared to other categories, indicating a need for tailored national healthcare schemes.

Anaemia Among Children Aged 5-9

Table 8 shows the prevalence of anaemia among children aged 5-9 by social categories, showing that tribal children have the highest prevalence at 37.8 percent, followed by SC children at 24.1 percent. Other communities display nearly equal shares of anaemia. According to WHO guidelines, populations with 20 percent to 39.9 percent anaemic children are at moderate risk. Thus, ST children aged 5-9 exhibit moderate public health concerns, with about 17 percent in this range, while SC children have around 4 percent. The other two groups hover near the lower limit of moderate concern, with ST children consistently showing higher percentages of anaemia at all levels.

A chi-square test was conducted after calculating the observed and expected values of any level of anaemia-affected and non-affected children from the percentages and the weighted numbers for each social category, as given in Tables 7 and 8. The details are presented in Table 9.

Table 9 shows that all comparisons yielded degrees of freedom (df) of 1, with a critical value of 3.841 at a significance level of 0.05. The analysis indicates significant differences in anaemia prevalence, with ST children showing increased risk compared to SC, OBC, and Other communities. Since the percentage share of the tribal children in all these measured categories is higher than the percentage share of all children of all other categories, it is apparent that the tribal children are significantly at a greater risk of suffering from anaemia as compared to the children of other social categories.

Table 7: Percentage of children aged 1–4 classified as having anaemia by social category, India, CNNS 2016–18

Social categories compared	*Percentage of anaemic children aged 1-4 by haemoglobin level*				*Weighted number*
	Any form of anaemia (<11.0 g/dl)	*Mild anaemia (10.0–10.9g/dl)*	*Moderate anaemia (7.0–9.9 g/dl)*	*Severe anaemia (<7.0 g/dl)*	
SC	43.7	25.0	17.2	1.5	2,532
ST	53.1	26.6	24.7	1.8	1,423
OBC	36.4	18.6	16.8	1.0	4,663
Other	37.7	20.7	15.9	1.1	2,615

Source: Comprehensive National Nutritional Survey 2016-2018, (Table 6.1, P. 170)

Table 8: Percentage of children aged 5-9 classified as having anaemia by social category, India, CNNS 2016–18

Social categories compared	*Percentage of anaemic children aged 5-9 by haemoglobin level*				*Weighted number*
	Any (<11.5 g/dl)	*Mild (11.0–11.4 g/dl)*	*Moderate (8.0–10.9 g/dl)*	*Severe (<8.0 g/dl)*	
SC	24.1	10.6	12.7	0.8	3,327
ST	37.8	12.8	23.5	1.5	1,780
OBC	20.7	9.7	10.4	0.6	5,890
Other	20.5	9.3	10.9	0.3	3,667

Source: Comprehensive National Nutritional Survey 2016-2018, (Table 6.3, P. 172)

Table 9: χ^2 test result for the prevalence of anaemia among children aged 1-4 and 5-9

Social categories compared	*Children aged 1-4*				*Children aged 5-9*			
	χ^2 statistic	*(df)*	*Critical value (α = 0.05)*	*Inferences*	*χ^2 statistic*	*(df)*	*Critical value (α = 0.05)*	*Inferences*
ST vs SC	194.00	1	3.841	Significant	1070.67	1	3.841	Significant
ST vs OBC	139.93	1	3.841	Significant	1041.18	1	3.841	Significant
ST vs Other	142.67	1	3.841	Significant	1006.90	1	3.841	Significant

Source: Calculated by the author.

Micronutrient Deficiency Among Tribal Children

Vitamin A Deficiency (VAD)

Vitamin A is an essential micronutrient because it is particularly important for immune function and contributes to children's growth. Thus, inadequate intake of vitamin A can lead to visual impairment (night blindness) and increase the risk of morbidity and mortality from common childhood infections. One can see a global burden of high vitamin A deficiency. Therefore, the WHO (2011) recommends high-dose vitamin A supplementation for infants and children 6 to 59 months of age in those regions where VAD has been a public health problem.

Vitamin D contributes to bone health in children, and adequate intake is recommended to prevent growth faltering. Low consumption of vitamin D-rich food and low exposure to ultraviolet B (UVB) radiation from sunlight increase the risk of vitamin D deficiency. In the CNNS, vitamin D status was assessed by measuring serum 25(OH)D concentration with an antibody-competitive immunoassay using direct chemiluminescence (Siemens Centaur). According to Institute of Medicine guidelines (2010), a cut-off of <12 ng/mL (30 nmol/L) was used to define vitamin D deficiency among children aged 1-9 years and adolescents aged 10-19. For this paper, the percentage distribution and values for the children aged 1-4 were considered, as shown in Table 10.

Table 10 shows that the percentage of Vitamin D-deficient tribal children is less than that of deficient children from all other social categories. In the case of vitamin A, the percentage of deficient tribal children is less than that of SC and OBC children. However, children in Other communities have the lowest percentage of vitamin A deficiency. The researchers can conclude here that the ST children are treading better compared to many other communities.

A chi-square test was performed to determine whether there is a statistically significant difference in the prevalence of vitamin A and D deficiency among children across social categories. The observed value for deficient and non-deficient children was calculated based on the percentages provided and the total weighted numbers for each social category. The statistically significant differences were calculated for each social category compared to the ST children. Table 11 presents the results of the chi-square test.

The calculated chi-square statistics for all comparisons significantly exceed the critical value of

Table 10: Percentage of children aged 1–4 years classified as having vitamin A and Vitamin D by social categories, India, CNNS 2016–18

Social categories compared	*Vitamin A deficiency*		*Vitamin D deficiency*	
	Percentage	*Weighted number*	*Percentage*	*Weighted number*
SC	20.6	1,688	17.4	2,286
ST	17.2	692	8.7	1,280
OBC	19.0	2,742	13.6	4,059
Other	12.1	1,568	13.5	2,339

Source: Comprehensive National Nutritional Survey 2016-2018, (Table 7.1, P. 193)

Table 11: Chi-square table for vitamin A and D deficiency among children aged 1-4

Social categories compared	*Vitamin A Deficiency*				*Vitamin D Deficiency*			
	χ^2 statistic	*(df)*	*Critical value (α = 0.05)*	*Inferences*	*χ^2 statistic*	*(df)*	*Critical value (α = 0.05)*	*Inferences*
ST vs SC	710.72	1	3.841	Significant	108.34	1	3.841	Significant
ST vs OBC	709.48	1	3.841	Significant	138.90	1	3.841	Significant
ST vs Other	704.90	1	3.841	Significant	106.01	1	3.841	Significant

Source: Calculated by the author

3.841 at a 0.05 significance level. This indicates a statistically significant difference in Vitamin A and D deficiency among children across the various social categories. Comparing it with the percentage distribution, it can be concluded that tribal children are significantly more likely to suffer from vitamin A deficiency than the children of the Other community and less likely than the SC and OBC children. Since the percentage of vitamin D-deficient children among tribes is lower than in all other social categories, it can be concluded that tribal children are in a better position regarding the richness of vitamin D in their bodies. The high chi-square values strongly correlate with social categories and Vitamin A deficiency status. The ST shows notable differences in deficiency rates compared to SC, OBC, and Other communities.

DISCUSSION

Nuance Between Subjective and Objective Aspects of Health

The literature reviewed and the evidence presented in the foregoing parts highlighted that health is a multifaceted construct shaped significantly by subjective experiences and cultural contexts, particularly among tribal and indigenous populations. Contemporary literature increasingly supports the notion that health and well-being are not simply clinical terms but involve a complex interplay of physical, emotional, social, and environmental factors. These findings align with various researchers, such as Christoforou et al. (2024), who found that cultural and contextual dynamics profoundly influence individual variations in perceiving health and well-being. This aspect challenges the dominance of the traditional biomedical model that has historically oversimplified the concept of health. The argument also aligns with the works of Maher (1999) and Bautista-Valarezo et al. (2020), who found that indigenous people have a diversity of beliefs and practices across different cultures, and the indigenous healers view health as the totality of physical, emotional, spiritual, and social well-being. The argument that health is both subjective as well as objective is supported by the findings of Wober (2014) in Southern African !Kungs, Dêbska (n.d.) among Hopis, and Kumar and Baudh (2021) among Gond in India, where it has been revealed that the perception of cultural identity, belongingness, and existence surrounds objective phenomena such as birth. The literature reviewed and analysed also supports the argument that a nuanced interaction exists between subjective and objective phenomena. For instance, the studies by Gumà (2021), Leite et al. (2019), and Ruggeri et al. (2020) reveal that objective phenomena such as chronic illness and health indicators are translated into a multidimensional view of well-being encompassing both hedonic and eudaimonic elements across diverse populations.

Further, while one incorporates environmental factors as an objective phenomenon that contributes to shaping health perceptions, social engagement as a subjective phenomenon plays a vital role, as found by Tanaka et al. (2020) and Christoforou et al. (2024). The nature of social engagement is again shaped by cultural variations, making health perceptions a complex phenomenon, as supported by the study of Maniscalco et al. (2020).

Though economic conditions are an objective phenomenon, the responses people generate to such conditions are subjective in nature and influence health perception and action. Such a relationship has been supported by the work of Zakaria et al. (2019), Rivadeneira et al. (2022), Dey and Bisai (2019) and Jaleel et al. (2023) identified a link be-

tween disparity in healthcare access to poverty, healthcare access, and maternal health.

In summary, the breadth of literature supports the argument that health is not an absolute objective domain but is significantly influenced by subjective components, especially in tribal and indigenous communities. This complexity necessitates a departure from oversimplified definitions of health toward culturally sensitive, inclusive frameworks that consider individual experiences, environmental contexts, and social determinants in health promotion strategies. Future research should continue exploring these intersections to develop comprehensive health policies that resonate with the diverse populations they aim to serve.

Malnutrition and Growth Concerns

Anthropometric assessments reveal alarming rates of malnutrition among tribal children compared to their counterparts in other social categories, such as SC and OBC. The National Family Health Survey (NFHS-5) reports stunting rates exceeding 55 percent and approximately 20 percent of tribal children affected by wasting (International Institute for Population Sciences [IIPS] and ICF 2021). Since the findings of this analysis are based on extensive national-level data, the individual-level research findings are more or less nearer to these results. The analysis clearly indicates that tribal children aged 0-4 and 5-9 are suffering from inadequate growth, which can be attributed to malnourishment. The difference in the extent of malnourishment among tribal children, from moderate to severe, is statistically significant as compared to all social categories in the country.

Prevalence of Anaemia in Tribal Children

The prevalence of anaemia in India is alarming, particularly among children in tribal areas. The National Family Health Survey (NFHS-5) indicates that approximately 58 percent of tribal children aged 6-59 months are anaemic. This rate is significantly higher than the prevalence in non-tribal populations, showcasing the urgent need for focused health interventions (IIPS and ICF 2021). The analysis of the prevalence and the extent of anaemia in this paper shows that the severity of anaemia among tribal children is the highest of all. The percentage share of 'any anaemia' incidence in the tribal population is much higher (53%) than the national cut-off percentage of 40 percent for public health concerns.

Micronutrient Deficiency Among Tribal Children

In contrast to the growth concerns and extent of anaemia, tribal children show a better status in terms of Vitamin D content and, to some extent, Vitamin A deficiency. Among all social categories, tribal children have the lowest percentage of children having vitamin D deficiency. They also have a vitamin A deficiency, less than SC and OBC children, and slightly more than the Other community children. This indicates a better position in micronutrient content among the tribal children.

Explaining the Related Causes of the Health Status of Tribal Children

Socioeconomic Factors Influencing Nutrition

Studies demonstrate a direct correlation between low household income and the prevalence of malnutrition among tribal children (Kumar et al. 2024; Singh et al. 2015). Additionally, geographical constraints often limit these communities' access to health services and nutritious food, as Sinha (2018) notes, tribal children in Jharkhand suffer from higher rates of stunting and wasting due to these barriers.

Dietary Practices and Nutritional Deficiencies

Studies have proved that relying heavily on seasonal and organic foods contributes to a lack of dietary diversity among tribal children. It is evident that tribal people incorporate wild plants and herbs that can provide fibre and micronutrients. However, due to improper and inadequate blending of different food items, tribal children frequently suffer from deficiencies in iron, vitamin A, and iodine. Furthermore, the overconsumption of staple carbohydrates leads to imbalances in protein and essential fatty acids. Since tribal people primarily rely on local food products, the seasonal variations in food availability and scarcity of particular foods in certain seasons negatively affect children's growth. The study conducted by Samal and Mishra (2020) in Odisha falls firmly within such findings. Gupta's (1980) study supports the find-

ings of widespread nutritional deficiencies among tribal groups in India. His research, encompassing 31 tribes across various regions, found that while some groups had adequate nutritional intake, a significant portion experienced undernutrition and nutrient deficiencies, ranging from mild to severe depletion, impacting physical health and potentially contributing to the decline of specific tribal populations. Similarly, the review article of Bhoi and Kumar (2023), the study of Ghosh and Varerkar (2019), Lenka (2016), and many others reveal similar results.

Cultural Beliefs and Health Practices

According to several studies, cultural beliefs and practices are identified as crucial components in shaping the health outcomes of tribal children. Dietary restrictions and traditional food taboos of certain kinds can limit the intake of essential nutrients in expecting and lactating mothers, infants, and children. It may lead to imbalanced diets and result in malnourished children, as established by the study of Meyer-Rochow (2009) and Lakshmi (2013) in coastal Andhra Pradesh, Ade et al. (2023) among the South Indian tribes, Jayadi et al. (2020) in Indonesia, Nurbaya et al. (2024) in South Sulawesi, Ramenzoni (2023) in Eastern Indonesia, and many others.

Traditional healing practices also play a role, with many indigenous tribes adopting a holistic view of health that integrates physical, emotional, spiritual, and social well-being. Indigenous health is intrinsically linked to the land and the community's cultural heritage. Such holistic beliefs often affect health-seeking behaviours and attitudes toward modern medical interventions. Several studies in tribal domains in India and the world over have established such associations. For instance, the study of Dung Dung and Pattanaik (2021) in Odisha, Degefa et al. (2022) in Ethiopia, Taib et al. (2021) in Mollucass Province, and many more.

Probable Causes of Anaemia

A host of research papers conclude that tribal children are more vulnerable to anaemia due to several interrelated reasons. These studies have shown that a lack of access to iron-rich foods contributes significantly to anaemia in these populations. Further, many tribal diets consist predominantly of cereals and roots, low in iron and other essential nutrients. The consumption of green leafy vegetables, a crucial dietary source of iron, is limited due to socio-economic and cultural barriers. Besides, the burden of infectious diseases, particularly malaria and helminthic infections, is much higher in tribal areas, considering their geophysical conditions. These diseases lead to blood loss and impair red blood cell production. In addition to these factors, chronic poverty significantly affects the health status of tribal children. Limited access to healthcare services, education, and clean drinking water exacerbates malnutrition and increases infection vulnerability. The studies by Kamath et al. (2013) in Karnataka, Parmar (2022) in Maharashtra, Ghosal et al. (2023) on NFHS data, and Leepile et al. (2021) in rural Botswana for the San people have established such findings as valid.

Vitamin A and D Deficiency

Several factors are responsible for the lower prevalence of VAD among tribal children compared to SC and OBC, which can be attributed to several factors. These may include dietary diversity and traditional knowledge, wherein they often consume various locally sourced foods rich in carotenoids, such as dark leafy greens, yellow and orange fruits, and root vegetables. Further, many tribal groups maintain agricultural and hunting practices that provide a steady supply of nutrient-rich foods, mitigating deficiencies. Finally, there are drives for vitamin A supplements as social welfare measures initiated by the concerned government may boost vitamin A in the community. Literature on the dietary practice of tribal people and its impact on vitamin A deficiency is scanty. Amidst the scanty sources, the studies by Arlappa et al. (2023) in Kerala, Kundu et al. (2021) on national-level data, and Suri et al. (2017) in Jammu, support these statements on the factors related to VAD.

Similarly, the lower prevalence of vitamin D deficiency among tribal children may be explained in the following lines. Adequate sun exposure is the primary source of vitamin D for most individuals. Further, living in tropical and subtropical areas can enhance vitamin D levels since most tribal people are in such regions. Due to their rural or forested living conditions, tribal children often engage in more outdoor activities, increasing sun exposure, a key factor for vitamin D synthesis. Thus,

tribal communities may have higher vitamin D levels despite diets low in fortified foods. Some tribes consume local sources of vitamin D, such as fish and certain nutrient-rich plants. Ethnobotanical studies reveal that indigenous peoples possess knowledge of local flora that may help mitigate deficiencies. Frost's (2012) study among Northern Native Peoples, Inuit, and Amerindians suggests a strong relationship between vitamin D and living in higher latitude regions where vitamin D synthesis remains low most of the year, having darker skin that blocks solar UVB, and a lack of access to vitamin D-rich dietary sources. Khan et al. (2018) found no significant difference in vitamin D levels between tribal and other children in rural Kerala. The authors observed a rise in vitamin D levels in summer when exposure to sunlight increased. Luxwolda et al. (2012) showed that the vitamin D levels of Masai people who do herding as tradition were much higher than the Hadzabe hunter-gatherers, who often avoided direct sun exposure. The nature-dependent and self-production of food among tribal people have been mentioned in several places in this paper. However, one must consider the changing surroundings of tribal people that rob them of their natural habitats and food security and variety, which must significantly impact micronutrient intake.

The examination of the nutritional health status of tribal children in India reveals a complex interplay of biological, cultural, socioeconomic, and environmental factors that significantly influence their health outcomes. The discussion highlights alarming rates of malnutrition, with tribal children experiencing stunting rates exceeding 55 percent and approximately 58 percent suffering from anaemia, both of which are markedly higher when compared to children from other social categories, such as SC and OBC. The analysis indicates that the socioeconomic conditions prevalent in tribal communities, including low household incomes and geographical isolation, play a crucial role in perpetuating malnutrition. Limited access to healthcare services and nutritious food compounds these issues, creating a cycle of poor health among tribal children that warrants immediate action. In comparative terms, while children from SC and OBC backgrounds also face nutritional challenges, the severity of malnutrition and health complications among tribal children is disproportionately higher.

Cultural beliefs and dietary practices are significant determinants of health in tribal societies. The reliance on seasonal and locally sourced foods, while offering some resilience in micronutrient intake, often leads to nutritional deficiencies in essential vitamins and minerals, particularly iron and iodine. In contrast, children from SC and OBC communities may have better access to nutrient-dense foods but still experience health issues linked to social inequities. Traditional dietary restrictions and belief systems among tribal populations further exacerbate these deficiencies.

Interestingly, the status of micronutrient deficiencies presents a comparative advantage for tribal children regarding vitamin A and D levels. Their diets, including local foods rich in carotenoids and increased sun exposure, result in lower rates of vitamin A and D deficiency than their SC and OBC counterparts, who may have less access to such dietary diversity. However, these advantages must be understood in the context of the broader challenges tribal communities face, including environmental changes that impact food security and access to natural resources.

Anaemia, significantly prevalent among tribal children, serves as a testament to the cumulative impact of various factors, including poor dietary practices, limited access to nutrient-rich foods, and heightened susceptibility to infectious diseases. The comparative analysis reveals that while tribal children face unique challenges, the overarching need for comprehensive, community-specific interventions applies to all social categories suffering from malnutrition.

CONCLUSION

The nutritional health status of tribal children in India reflects a critical public health challenge shaped by socioeconomic disparities, cultural practices, and environmental barriers. High rates of stunting and anaemia, exacerbated by limited healthcare access and nutrient-poor diets, highlight systemic inequities compared to other social groups. While tribal children exhibit relative advantages in vitamin A and D due to traditional diets and sun exposure, persistent deficiencies in iron and iodine underscore the need for culturally sensitive interventions. Addressing these issues demands collaborative, multifaceted strategies integrating improved healthcare access, nutrition

education, and sustainable food security initiatives while respecting traditional knowledge. Prioritising such tailored approaches is essential to ensure equitable health outcomes and foster holistic development for tribal children.

RECOMMENDATIONS

The nutritional health of tribal children is a significant concern, influenced by food insecurity, limited healthcare access, and socio-economic challenges. To effectively address these issues, targeted policy recommendations are essential. Based on the findings of the study, the following recommendations may be forwarded.

Community-based Nutritional Education Programs

Implementing community-based nutritional education programs tailored for tribal communities is a crucial step. These programs should educate families on nutrition, healthy eating habits, and culturally relevant dietary practices. Involving tribal members as educators will foster trust and empower the community by integrating traditional knowledge.

Supplementary Feeding and Micronutrient Programs

Supplementary feeding and micronutrient programs provide essential nutrients, particularly for vulnerable populations. Collaborating with local agricultural initiatives to incorporate native crops can yield nutritional support and contribute to local farmers' economic well-being.

Strengthening Healthcare Access

Enhancing healthcare access by establishing mobile clinics and telehealth services can bridge the gaps in health services. Healthcare providers may be educated on the unique cultural and nutritional needs of tribal populations to ensure effective care delivery.

Monitoring and Evaluation Framework

An intense monitoring and evaluation framework may be developed to track improvements in nutritional status and participation rates, regularly evaluate progress, and identify areas for improvement.

Community Engagement and Empowerment

Lastly, fostering community engagement and empowerment is vital for the sustainability of health initiatives. Involving tribal leaders, parents, and children in planning and execution creates ownership and commitment.

In conclusion, improving the nutritional health of tribal children requires a comprehensive approach that combines education, direct nutritional support, enhanced healthcare access, effective evaluation, and community empowerment. By implementing these targeted policy recommendations, one can create a framework that not only enhances the immediate health of tribal children but also promotes a healthier future for generations to come.

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