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FOOD AND NUTRITIONAL STATUS OF TRIBAL STUDENTS IN TAMIL NADU: SYSTEMATIC REVIEW OF THE LAST DECADE

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Abstract: The dietary and nutritional conditions of tribal students in Tamil Nadu are the determining factors of their overall health, educational performance and well-being. This systematic review has the overarching goal of consolidating available literature to evaluate the nutritional status of school student in Tamil Nadu, prevalence, micronutrient deficiencies and related Ecological and cultural determinants influencing tribal school children in the last decades. A comprehensive search of peer-reviewed journals, government publications and grey literature was showed using databases such as PubMed, Scopus and Google Scholar. The review emphasizes the widespread problems of malnutrition such as malnutrition, micronutrient deficiencies and over nutrition caused by dietary patterns. Furthermore, it discusses the effects of government nutrition programs and interventions to enhance the nutritional status of tribal students. A total 30 studies met the inclusion criteria and were reviewed. These studies highlight the nutritional challenges tackled by the tribal children in Tamil Nadu. This systematic review meta-analysis, poor food intake habits, lack of macro and micronutrients, inadequate dietary diversity, unhygienic environments, poverty, low literacy level and limited awareness of government policies increases the risk of under nutrition among tribal children. The findings of this analysis will help in preparing policy suggestions and focused nutrition interventions to enhance educational performance and health status of Tamil Nadu tribal students.

Keywords: dietary diversity, food consumption, health interventions, malnutrition, micronutrient deficiency, nutritional status, tribal children.

I. INTRODUCTION

India has a diverse tribal heritage, with Adivasis comprising 8.6% of the population (104 million, Census 2011). The country recognizes 705 Scheduled Tribes, in Tamil Nadu, where 794,697 tribal individuals reside. The Irulas are one of the largest tribes in Tamil Nadu [1]. Tribal communities face significant challenges, including poor education, inadequate healthcare, poverty, and reliance on agriculture [2] [3] [4] [5]. Improvement in the India's financial status over the last several decades may affect the malnutrition rates whereas also posing new challenges such as the COVID-19 pandemic (2020–2022). While India is 'on track' to reach the stunting reduction targets, 34.7 percent of children below five are still afflicted, which is higher than the average of Asia regions 21.8%. This high level of development failure severely impacts life, cognitive development, school performance and future productivity. India must address the needs of these disenfranchised groups if it hopes to meet the Sustainable Development Goals (SDGs) [6]

The Constitution of India enriched with many provisions for the Scheduled Castes and tribes, and they are still technologically and economically backward. Their culture, language, beliefs and customs are diverse. There are 427 major tribal communities in India and 36 tribal communities in Tamil Nadu. India has the second highest density of tribal population in the world after Africa. The following bar graph demonstrates the percentage distribution of the scheduled tribal population across various districts in Tamil Nadu.

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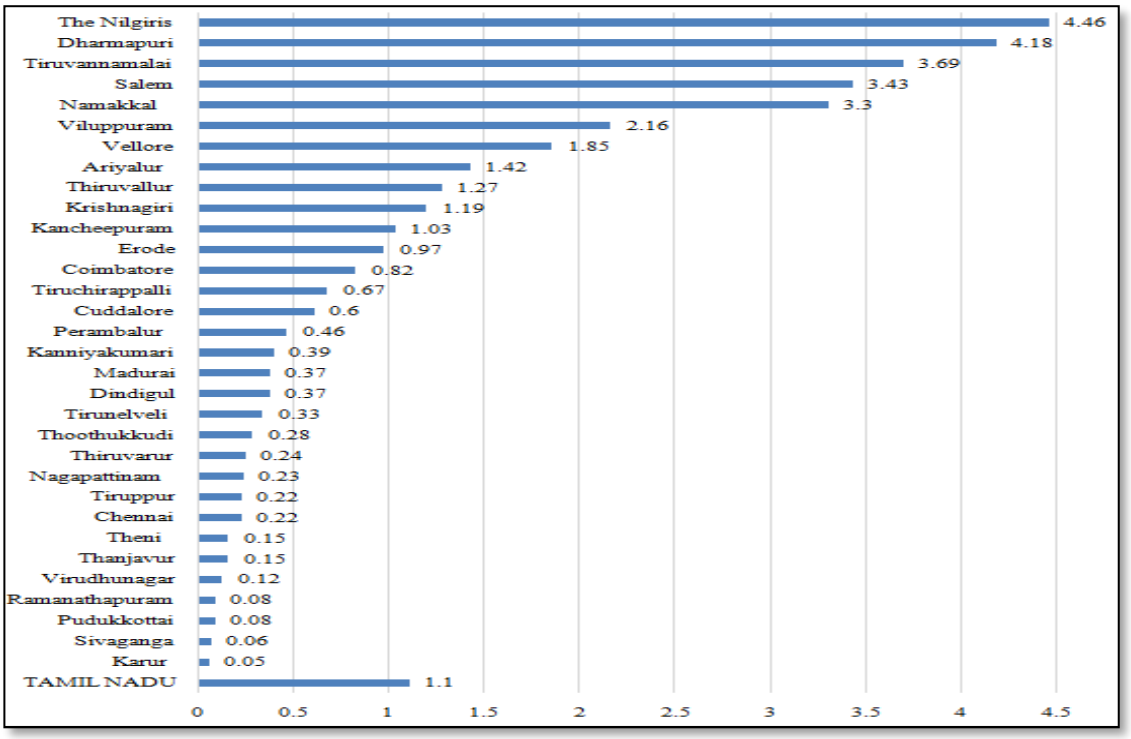

Figure 1: Percentage of Scheduled Tribes population in Tamil Nadu (Source: Socio-Economic Status of Scheduled Tribes: A Study of Tamilnadu State R. Hariharan (2022). [7]

According to Figure 1, the Nilgiris areas have the greatest proportion (4.46%), followed by Dharmapuri (4.18%) and Tiruvannamalai (3.69%). Salem (3.43%), Nammakal (3.30%), and Villupuram (2.16%) have the highest populations. The lowest percentages, however, are found in Karur (0.05%), Sivagangai (0.06%), and Pudukkottai. The average population of Tamil Nadu is about 1.1%.

II. MATERIALS AND METHODS

A systematic search of the literature was performed across various scientific databases including PubMed, Scopus, Google scholar, Peer reviewed journals, government publications in the last decades from 2014 to 2024. Key words such as tribal children malnutrition, food consumption, micronutrient deficiency were used in combination to search for appropriate articles. The research was limited to studies published in English. Studies were incorporate if they met in the following criteria 1.tribal school children 2.Nutritional status 3. Last decade journals from 2014 to 2024.

Study selection process

The study selection process was carried out in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020. The following flow diagram flow diagram displays the various stages of the systematic review, detailing the number of records identified, involved and discarded along with the reasons for rejection.

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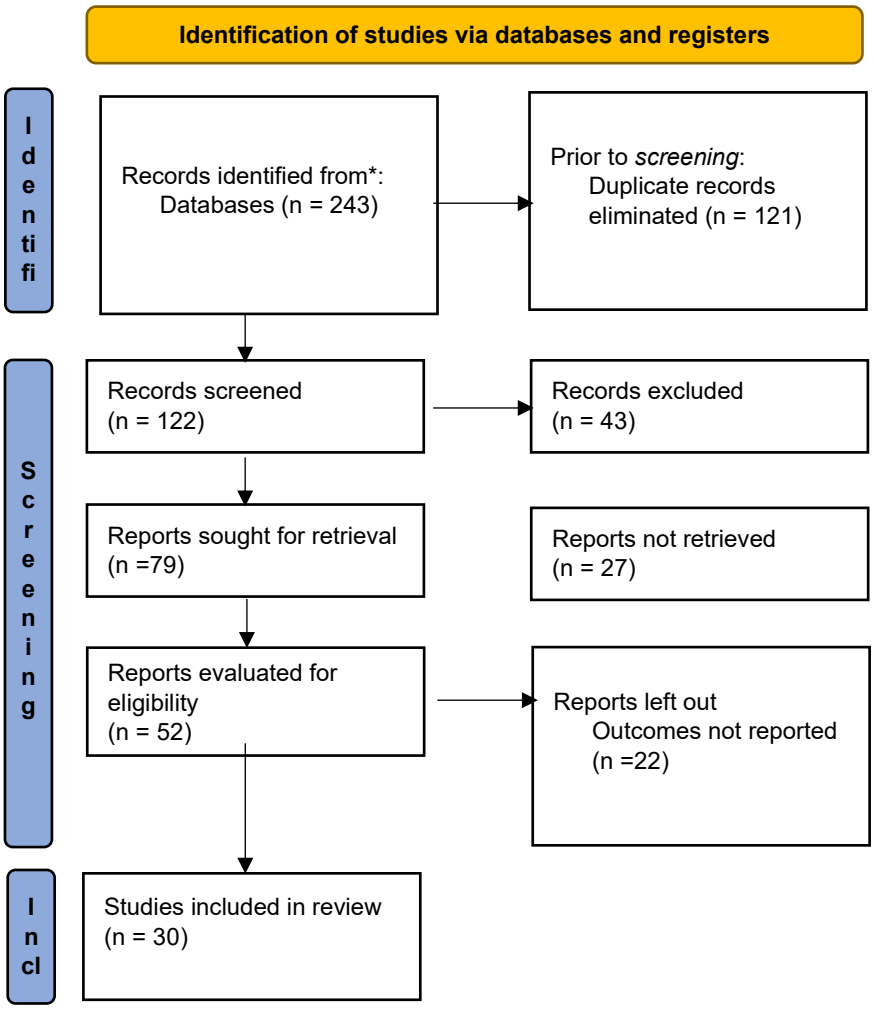

Figure 2: Preferred reporting items for Systematic reviews and Meta analyses (PRISMA) Flow Diagram

In Figure 2 represents all retrieved articles (n = 243) were imported into Mendeley Reference Manager, and duplicates (n = 121) were removed. The remaining 122 records were screened by title and abstract. Of these, 43 were excluded because they did not meet the inclusion criteria. A total of 79 complete text were assessed for eligibility. After full-text review, 27 studies were removed for reasons including invalid population (n = 13), irrelevant results (n = 8), and invalid study design (n = 6). Ultimately 52 papers satisfied the eligible measures. Finally, 30 studies included in the systematic review after meeting full filling all the requirements.

Critical evaluation

According to the review and meta-analysis, the tribal children continue to face multiple interrelated challenges, including poor dietary intake, inadequate consumption of both macro- and micronutrients, and low dietary diversity .These nutritional deficits are compounded by socio-economic barriers such as poverty, low parental literacy, and minimal awareness or utilization of existing government nutrition and welfare schemes. Basic information, food intake patterns of tribal children, nutritional status of tribal children in Tamil Nadu, Incidence of malnutrition in tribal children in India, current scenario - triple burden of malnutrition, Consequences of micronutrient deficiency among tribal children and government policies and programs for tribal children were discussed below.

Basic Information

The basic information such as socio - economic and cultural factors, educational status of father and mother of tribal children were conferred below.

Socio - economic and cultural factors

Despite several schemes and policies in the framework of 2015, tribal remained one of the most vulnerable groups in India. This was mainly due to their poor health care system, geographical isolation from society, their beliefs and customs and ignorance among parents, which greatly affected tribal children in the society. Poverty, lack of higher education, lack

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of drinking water, unsanitary living conditions, and lack of awareness were all major reasons that prominently affected the social development of tribal children. [8].

Educational status of Father and Mother

Parental education is an important indicator as it helps in maintaining the nutritional needs of the children. Among tribal communities socio-economically poor and lack of education and awareness, contributes parents are not aware of the health status of their children. The majority of the tribal families depend on agriculture and indigenous forest products. But in the lack of education, they secure proper employment and exploited within their local areas. As a result, poverty inhibits them from accessing nutritious food, and low quantity and poor quality of food enhance their vulnerability to malnutrition among children. The below table-1 explains the socio - economic and educational status of their families.

Table 1: Educational status of father and mother and socio - economic status of Tribal children

Author, Area& Sample Size	Education of father		Education of mother		Status of family		
	Literate	Illiterate	Literate	Illiterate	High	Medium	low
Sunny et al.(2021) Nilgiri,(N=605)	191 (31.57%)	414 (68.42%)	167 (27.60%)	438 (72.39%)	_	147 (24.29%)	448 (74.04%)
Senthilkumar et al. (2015) Periyanaikanpalayam,=206	144 (69.90%)	62 (30.09%)	119 (57.76%)	87 (42.23%)	_	171 (83%)	35 (16%)

In table 1, based on the study conducted at Nilgiri, (n=605) 74.4% of the families had low educational status, in that 31.57% of father and 27.6% of mothers were illiterate. Whereas the study conducted at Periyanaikanpalayam block, (n=206) says 83% of the families had medium educational status with 69.9% of father and mothers were illiterate. [10]

Food Intake Patterns of Tribal Children

Traditionally, millets have played an important role in tribal diets. [11] [12] Families prefer rice because it is available at a very low subsidized price under the Public Distribution Scheme (PDS), and it is also palatable. However, excessive rice consumption can reduce food intake and affect food and nutritional security. The diets of Indian tribal children often lack essential dairy, fruits, vegetables, pulses and meat, leading to micronutrient deficiencies including iron, vitamin A, vitamin C and zinc, which are exacerbated by high phytate levels in staple foods such as rice. [13] [14] [15] Chronic micronutrient deficiencies, or "hidden hunger", due to lack of dietary diversity contributes to India's low ranking in nutritional quality (70th out of 187). [16] This inadequate dietary diversity leads to micronutrient deficiencies, which contribute to Malnutrition.

Among the Toda community in the Nilgiris, approximately one percent expressed a preference for purchasing convenience food items such as idli-dosa batter, masala powders, vermicelli, and pickles. It was also observed that they consumed commercially prepared food once or twice a week, typically when they left their *munds* for occupational reasons. [17]. In the case of the Irular community, 23% reported consuming biscuits twice a week as a snack. Fast food consumption was noted to be occasional among only 7% of the selected tribal population, while 93% stated they had never consumed such items. This gradual shift from nutrient-dense traditional diets to energy-rich market-based foods reflects a broader pattern of nutrition transition, a phenomenon increasingly documented not only among indigenous communities across India but also in global contexts 11. [18]

Nutritional status of tribal children in Tamil Nadu

The nutritional status of tribal children in India is alarming. According to the recent UNICEF report "Feeding India's Tribal Children" – tribal people in India are the most undernourished social economic groups in the country. Children in particularly tribal suffer high rates of malnutrition (stunting, wasting, weight loss), including protein-energy malnutrition, vitamin A deficiency and anemia due to poor dietary habits. In the study carryout in Ranchi district found 44.5% of preschool (3-6) and school children (6-12) in were suffering from various degrees of malnutrition respectively [19]. An additional study carried out in the Pillur Beet, Coimbatore district, out of sixty tribal children aged 4-11 years, 46.67% were found to be malnourished. 65% of the respondents were aware of the food items provided to their child and 35% of the respondents were not aware of the food items. [20].

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Prevalence of Malnutrition in tribal children in India

A meta-analysis of 40 studies on Indian preschool tribal children revealed high rates of underweight (39.25%), stunting (39.67%), and wasting (19.54%). These issues are linked to socioeconomic and cultural factors, including inadequate child nutrition, poor maternal diet during pregnancy, improper feeding practices, and lack of maternal education, food culture, and low socioeconomic status. The findings emphasize the need for targeted nutritional interventions and socio-economic development programs within tribal communities. [21].

Table 2: Studies conducted the Incidence of Malnutrition and nutritional deficiencies of Tribal students

Author, Area& Sample Size	Anaemia	PEM	Under Weight	Stunting	Wasting
Kirubadevi et al.(2015) Velliangiri hills, (N=210)	14% - Moderate 36% - Mild	-	9%	_	_
Twara et al. (2015) Eastern Uthra Pradesh, (N=1221)	-	_	-	43.73%	5.10%

Table 2 represents the incidence of malnutrition and nutritional deficiencies among tribal school children in different parts of India. Followed by Velliangiri highlands, enquiry with 210 tribal youngsters aged 6 to 15. The findings indicated that 9% of the children were underweight, 14% were with moderate anaemia, and 36% had a mild level of anaemia. [22] Likewise, the Eastern Uttar Pradesh 1,221 tribal children of were wasting (51.10%) with respect to stunting (43.73%) Among the total number of participants, 728 (59.62%) were boys and 493 (40.38%) were girls, studying in different government primary and secondary schools situated in Chandawali and Sonbhadra. [23]

Current Scenario - Triple burden of malnutrition

(TBM) in India refers to the simultaneous presence of under nutrition, micronutrient deficiencies, and over nutrition, impacting children's development. Micronutrient deficiencies, a key component of TBM, are primarily caused by poor dietary intake and illness, but also influenced by lifestyle, sanitation, and inadequate government programs. Which has significant longstanding impact on the physical and mental development of children. According to reports from the Food Safety and Standards Authority of India (FSSAI), the primary focus is now on fortifying foods with essential micronutrients such as vitamin A, vitamin B12, vitamin D, iron, iodine, folic acid, and vitamin D. [24]

Health Consequences of micronutrient deficiency among tribal children

According to global estimation of WHO 43% of children in tribal areas have vital health problem. The tribal communities in Meghalaya tribal primary school children aged 8-11 years reported highest prevalence of anameia in boys (84.65%) and girls (83.98%) out of 1399 children. [25] Followed 300 pre-school tribal children in Gujarath 87.7% were found to be anemic, of these male 88.5%, female 86.8%, 53.7% deficient in vitamin B9 deficiency and 68% vitamin B12, 8.7% had sickle cell anemia (SCA) respectively. [26] Similarly in the western Kenya among 6–35 months preschool children found sickle cell disease (1.6%), Sickle cell trait (17.1%), homozygous (9.6%) and heterozygous α-thalassemia (38.5%).[27] This was also recorded in 2015 and quit prevalent among Indian tribes .[28]

Government policies and programs for tribal children

Despite the implementation of various National schemes by the central and state governments such as the Integrated Child Development Programme (1975) Provides supplementary nutrition, immunization, and preschool education through Anganwadi centers., National Rural Health Programme (including Janani Suraksha Yojana), Mid-Day Meal Scheme that provides free lunch to children in government and tribal welfare school and National Food Security Scheme, these initiatives still fail to effectively reach children under the age of three, which is a critical window for impactful nutrition interventions. [29] [30]

III. CONCLUSION

Malnutrition among tribal children in Tamil Nadu has been a major problem in the last ten years, affecting their health, education, economy and quality of life. This is due to their poverty, illiteracy, ignorance about the causes of diseases, hostile environment, poor sanitation, shortage of drinking water and blind beliefs. The frequency of malnutrition among tribal children in the country has shown a declining trend in the recent report of NFHS-5. However, there is a great need for more research on the nutritional status of children and associated micronutrient deficiencies, especially among the

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most disadvantaged tribal school children in Tamil Nadu. Furthermore, approaches such as nutrition education for them, balanced diet, exercise, health promotion, targeted interventions for tribal girls and effective implementation of government schemes can completely reduce child malnutrition in Tamil Nadu.

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