



# NUTRITIONAL DEFICIENCIES AMONG TRIBAL ATHLETES AND THEIR EFFECT ON PERFORMANCE METRICS

<sup>1</sup> Vikas Kumar Sahu, <sup>2</sup> Aman Tiwari, <sup>3</sup> Lallu Ram Pradhan

<sup>1</sup>Sports Officer, <sup>2</sup>Post Graduate Teacher, <sup>3</sup>Post Graduate Teacher

<sup>1</sup> St Teresa collage Raigarh,

<sup>1</sup> St Teresa collage Raigarh,

**Abstract:** Tribal athletes, though often naturally active and physically resilient, face significant nutritional disadvantages rooted in socio-economic and cultural disruptions. These deficiencies, particularly in key nutrients like iron, calcium, protein, and B vitamins, undermine their athletic development and competitive performance. This study synthesizes findings from tribal regions in India, including dietary intake, anthropometric measurements, and observed performance metrics, to examine how undernutrition among tribal athletes impairs endurance, muscle strength, injury recovery, and overall physiological function. It also recommends culturally relevant interventions such as the reintroduction of traditional diets, nutrition education, and structural food policy reforms. Addressing these challenges is essential not just for sports equity but for the holistic well-being and empowerment of tribal youth in India.

**Keywords:** Tribal athletes, performance metrics, nutrition deficiency, indigenous health, traditional diets

## I. INTRODUCTION

Athletic performance is heavily influenced by nutritional adequacy. From energy metabolism to muscular recovery and immune resilience, athletes require precise nutritional support tailored to the demands of intense physical activity. However, this requirement presents a complex challenge in tribal communities, where systemic undernutrition intersects with already elevated dietary demands due to sports participation. Historically, tribal diets were rooted in biodiversity and ecological balance. Indigenous communities consumed a variety of seasonal foods—millets, forest greens, roots, pulses, and protein-rich insects—providing balanced macronutrients and essential micronutrients. Colonization, land alienation, environmental degradation, and market-driven food systems have contributed to a gradual erosion of these dietary patterns. The result has been a shift toward energy-dense, nutrient-poor processed foods that fail to meet the physiological needs of tribal populations, especially adolescent athletes.

THIS STUDY EXPLORES HOW THESE NUTRITIONAL SHIFTS SPECIFICALLY AFFECT TRIBAL ATHLETES, ASSESSING THE PREVALENCE OF DIETARY DEFICIENCIES AND THEIR CONSEQUENCES ON MEASURABLE PERFORMANCE METRICS SUCH AS ENDURANCE, STRENGTH, AND RECOVERY. IT ALSO PROPOSES INTERVENTIONS TAILORED TO THE UNIQUE SOCIOCULTURAL AND ENVIRONMENTAL CONTEXTS OF TRIBAL INDIA.

## II. GENERAL NUTRITIONAL CHALLENGES IN ATHLETES

In athletes, optimal nutrition ensures muscle repair, hormonal regulation, hydration, and stamina. Common nutritional deficiencies in this group include calcium, iron, magnesium, B-vitamins, and vitamin D. Calcium plays a vital role in maintaining strong bones and ensuring proper nerve and muscle function, whereas iron is essential for carrying oxygen throughout the body.. Magnesium and B-complex vitamins facilitate energy

production and muscle relaxation. Vitamin D, often lacking due to limited dietary sources and sun exposure, further compounds skeletal issues when combined with low calcium.

Athletes from urban or affluent backgrounds often compensate through dietary planning and supplementation. Tribal athletes, however, frequently lack both access and awareness, resulting in cumulative deficiencies that impair their physical capacity over time.

### III. NUTRITIONAL STATUS OF TRIBAL COMMUNITIES

#### *III.I Historical Dietary Disruptions*

The nutritional health of tribal communities in India remains a persistent public health concern. Surveys conducted in regions like West Bengal, Chhattisgarh, and Maharashtra report high levels of undernutrition among tribal children and adolescents, with stunting affecting up to 58 percent of children and anemia rates exceeding 80 percent in certain districts.

Micronutrient deficiencies are similarly widespread. Calcium and iron deficits are particularly common due to limited consumption of dairy, legumes, and green vegetables. The decline in consumption of traditional foods—such as millets (madua, jowar), wild leafy greens (jangli saag), and tubers—has played a major role in this nutritional deterioration. Economic instability, rising market dependence, and deforestation have limited the availability of these nutrient-rich traditional ingredients. Additionally, the loss of intergenerational food knowledge has weakened community resilience, especially in households where modern education and migration further displace indigenous foodways.

### IV. EFFECTS ON PERFORMANCE: TRIBAL ATHLETES IN FOCUS

#### *IV.I Kanker Study on Nutritional Intake and Deficiency*

A study conducted in Kanker, Chhattisgarh, compared the nutritional intake of tribal sports school (TSP) athletes with their counterparts at Sports Authority of India (SAI) training centers. Results revealed a high incidence of protein, calcium, and vitamin D deficiency among tribal athletes, with values exceeding 85 percent. Iron deficiency affected between 72 to 88 percent of participants. B-vitamin intake was found to be suboptimal in 70 to 95 percent of cases. Even among SAI athletes, who had comparatively better facilities, certain deficiencies—particularly calcium and protein—were still observed.

These deficiencies translated directly into impaired performance metrics. Energy production was compromised due to inadequate carbohydrate and B-vitamin intake, leading to reduced stamina. Muscle recovery and growth were hindered by insufficient protein and magnesium, while skeletal integrity was weakened due to calcium and vitamin D deficits, increasing the risk of injuries. Iron deficiency significantly impacts endurance and aerobic capacity by limiting oxygen transport through hemoglobin.

#### *IV.II Anthropometric Comparison: Maharashtra Study*

In a separate comparative study conducted in Gadchiroli, Maharashtra, tribal and non-tribal male school students were assessed for anthropometric and physical fitness indicators. Tribal students displayed lower height, weight, and BMI values—suggesting chronic undernutrition—yet showed stronger abdominal muscle endurance, likely a result of daily physical labor and traditional lifestyle. However, this localized muscular strength could not compensate for the overall nutritional disadvantages, especially in terms of long-term growth potential, recovery, and athletic longevity.

While cardiovascular endurance showed no statistically significant difference between groups, the potential of tribal athletes remains stifled due to their inability to sustain intensive physical demands without appropriate dietary support.

### V. POLICY AND PROGRAMMATIC INTERVENTIONS

#### *V.I Short-Term Strategies*

Addressing nutritional deficiencies in tribal athletes requires a comprehensive approach that bridges immediate corrective actions with long-term structural reforms. In the short term, targeted supplementation of iron, calcium, vitamin D, and B-complex vitamins is essential for athletes diagnosed with micronutrient deficits. Fortification of mid-day meals, hostel diets, and training center food programs can help close nutritional gaps. Additionally, sports facilities should provide post-training nutritional recovery kits that include protein drinks and electrolyte beverages.

#### *V.II Structural and Cultural Reforms*

Long-term solutions must be rooted in food sovereignty and cultural relevance. Reintroducing indigenous foods such as millets, leafy greens, and tubers into public nutrition programs—including school lunches and public distribution systems—can significantly enhance dietary diversity and nutrient intake. School-based

nutrition education that incorporates local food knowledge should be encouraged, promoting intergenerational transmission of traditional dietary practices.

Economic measures such as subsidies on fresh produce and pulses can increase access, while taxes on ultra-processed foods may reduce dependency on nutritionally poor products. Additionally, scholarships for tribal youth to study nutrition, public health, and sports sciences will help cultivate a cadre of culturally competent professionals who can work in tribal communities.

Participatory nutrition research and indigenous data sovereignty are also critical. Tribal communities must be empowered to collect, analyze, and apply data related to their nutritional status. Tribal epidemiology centers can serve as valuable hubs for such work, producing localized, disaggregated data that informs state and national nutrition policy.

## VI. Conclusion

The performance potential of tribal athletes is undermined by systemic nutritional deficiencies that are rooted not in individual choices but in historical, socio-economic, and environmental injustices. Chronic undernutrition, particularly in proteins, iron, calcium, and vitamins B and D, severely limits physical growth, endurance, and recovery, resulting in a performance gap that widens over time.

Addressing these issues requires more than food supplementation. It demands a restoration of food sovereignty, revitalization of traditional diets, and implementation of culturally grounded policies that empower tribal communities. By investing in the nutritional well-being of tribal athletes, India not only promotes fairness in sports but also upholds its commitment to equity, diversity, and health justice.

## REFERENCES

1. Academy of Nutrition and Dietetics, Dietitians of Canada, American College of Sports Medicine. (2016). Nutrition and Athletic Performance. *Medicine & Science in Sports & Exercise*, 48(3), 543–568.
2. Bharati, P. et al. (2019). Nutritional status of tribal children in India: A review. *Anthropological Review*, 82(1), 1–19.
3. Chauhan, S. et al. (2021). Nutritional Deficiencies Among Tribal School Athletes in Kanker. *Int. J. Phys. Educ. Sports Sci.*, 9(2), 44–51.
4. Das, K. et al. (2020). Nutritional Status of Tribal Ho Women in West Bengal. *Journal of Community Health Research*, 12(3), 122–131.
5. FAO. (2015). *Indigenous Peoples' Food Systems and Well-being*.
6. Singh, A. et al. (2022). Impact of Nutritional Deficiencies on Physical Fitness. *Indian Journal of Health and Wellbeing*, 13(4), 226–233.
7. WHO. (2014). *Vitamin and Mineral Requirements in Human Nutrition*. 2nd ed.
8. Native Farm Bill Coalition. (2022). *Reimagining Nutrition Policy for Indigenous Peoples*.