European Economic Letters
ISSN 2323-5233
Vol 15, Issue 2 (2025)
http://eelet.org.uk

A Comprehensive Analysis of Impact of Government Nutrition Schemes on the Dietary Habits of Tribal Women in ITDA Kotaramachandrapuram Division, West Godavari (Eluru), Andhra Pradesh

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Introduction:
India is a culturally and geographically diverse nation, comprising populations residing in urban, rural, and tribal regions. Among these, tribal communities exhibit unique dietary patterns that markedly differ from the rest of the population. Numerous research studies have consistently demonstrated that the diets of tribal populations are often nutritionally inadequate, leading to various health implications.

Materials and Methods:
A community-based cross-sectional survey was undertaken in the Integrated Tribal Development Agency (ITDA) region of Kotaramachandrapuram, located in the West Godavari (Eluru) district of Andhra Pradesh. The study was conducted between April and October 2023 and targeted a sample of 225 tribal women aged between 15 and 49 years. Data collection was carried out using two standardized tools:

1. A Food Frequency Questionnaire (FFQ) to assess habitual dietary intake, and
2. A 24-hour Dietary Recall Questionnaire to capture detailed information about food consumption during the previous day.

Data analysis was performed using Microsoft Excel 2007, SPSS (trial version 21), and DietSoft software to evaluate nutritional intake and identify dietary trends.

Results:
Rice emerged as the most commonly consumed staple food, while Ambali (a traditional fermented rice gruel) was identified as the most frequent breakfast item. The five leading food items contributing to overall energy intake were Rice, Ambali, Vegetables, Tea with Milk, and Dal. The average daily energy intake among the tribal women was calculated to be 1931 kilocalories. The mean daily carbohydrate consumption was 367.14 grams, accounting for approximately 76.6% of total energy intake. Protein consumption averaged 49.83 grams per day (10.5% of total energy), while fat intake stood at 27.67 grams per day (12.9% of total energy).

Conclusion:
The findings revealed that nearly one-third of the women surveyed consumed less than 80% of the Recommended Dietary Allowance (RDA) for energy, which equates to 1784 kilocalories per day. Additionally, approximately 40% of the participants were consuming protein below 80% of the RDA, or less than 44 grams per day. These results underscore a significant nutritional gap among tribal women, highlighting the urgent need for targeted nutritional education interventions. Promoting awareness and eliminating food taboos can play a crucial role in enhancing dietary practices and improving overall health outcomes within these communities.

Abstract:

Introduction

India is a culturally diverse nation characterized by a heterogeneous population residing across urban, rural, and tribal regions. From an anthropological perspective, a tribe is defined as a socio-cultural unit comprising multiple local groups—such as villages or clans—bound together by common ancestry, shared traditions, a unified political structure, a rudimentary economic system, indigenous legal practices, and distinct religious beliefs and educational norms.[1] Tribal populations predominantly inhabit varied ecological and geo-climatic zones, including plains, dense forests, hilly terrains, and other geographically isolated and difficult-to-access regions.

The rich cultural heritage and traditional practices of each tribal group contribute to their unique identity, distinguishing them not only from the mainstream population but also from one another.[2] Among these distinguishing characteristics, dietary practices play a crucial role, as tribal communities often follow traditional food patterns influenced by local biodiversity, seasonal availability, and cultural taboos.

Numerous research studies conducted over the past two decades have consistently highlighted that the diets of India's tribal populations are markedly inadequate in essential nutrients.[3] [4] This nutritional deficiency frequently results in chronic energy deficiency, increased vulnerability to infections and diseases, diminished physical capacity, and overall deterioration in health status. Tribal women, being part of a socially and biologically vulnerable demographic, are particularly at risk. The cumulative effects of malnutrition in women can manifest in various adverse health outcomes, affecting not only their well-being but also that of their offspring and families.

Against this backdrop, the present study was undertaken in the tribal region of the Integrated Tribal Development Agency (ITDA), Kotaramachandrapuram Division, located in the West Godavari (Eluru) district of Andhra Pradesh. The primary objective of the study was to examine the dietary habits of tribal women and assess their nutritional intake, with the aim of identifying gaps and informing appropriate public health interventions.

Methods and Materials

The present study was designed as a population-based, cross-sectional survey, conducted in the tribal regions falling under the jurisdiction of the Integrated Tribal Development Agency (ITDA), Kotaramachandrapuram Division, located in the West Godavari (Eluru) district of Andhra Pradesh. The study was carried out over a period of seven months, from April to October 2023, targeting tribal women in the reproductive age group of 15 to 49 years.

The sample size for the study was determined using the Epi Info software, developed by the Centers for Disease Control and Prevention (CDC), which is widely utilized for public health research and population surveys. According to the Census of India 2011, the total population of the ITDA Kotaramachandrapuram Division was recorded as 604,047. Taking into account a 5% margin of error and an estimated 30% prevalence of inadequate nutrient intake among the target population, the required sample size was calculated to be 225 women.

A simple random sampling technique was employed to select Primary Health Centres (PHCs) for the survey. Out of a total of 37 PHCs operating within the ITDA Kotaramachandrapuram Division, 9 PHCs were randomly selected to serve as the primary sampling units. Subsequently, from each selected PHC, one representative village was randomly chosen to facilitate community-level data collection. In each of these villages, a house-to-house survey was conducted to identify and interview 25 eligible tribal women within the reproductive age group. In instances where the selected village or hamlet had a population too small to yield the required number of participants, adjacent villages or hamlets were included until the target sample size was reached.

Prior to the initiation of fieldwork, official written permission was obtained from the Additional District Medical and Health Officer (DM&HO) of ITDA to conduct the study and to receive logistical support from PHC staff. Assistance from frontline health workers, including Auxiliary Nurse Midwives (ANMs) and Accredited Social Health Activists (ASHAs), was sought for identifying eligible participants, establishing initial contact with households, and translating interviews when language barriers were encountered.

Eligibility criteria for participation included tribal women aged 15–49 years who were available at the time of the survey and who voluntarily consented to participate. Women who were pregnant, lactating, or suffering from any chronic illnesses were excluded from the study to avoid dietary alterations due to medical conditions.

Data collection was carried out using two structured instruments:

1. Food Frequency Questionnaire (FFQ):

This tool was used to gather information regarding the participants' usual dietary practices. Given the variability in daily diets among tribal populations, the FFQ focused on the frequency of consumption of various food items over the previous week, which was treated as a representative dietary cycle. Foods consumed were categorized into specific groups, including Cereals, Millets, Pulses, Oils, Vegetables, Green Leafy Vegetables, Milk and Milk Products, Flesh Foods (meat and fish), Eggs, Fruits and Nuts, Homemade Preserved Foods, Market-Based Packed Foods, and Alcoholic Beverages. Homemade preserved foods included items such as pickles or dried meat prepared using traditional methods, while packed foods referred to processed, ready-to-eat items like biscuits and snacks purchased from local shops or markets.

2. 24-Hour Dietary Recall Questionnaire:

A modified version of the standard 24-hour dietary recall questionnaire, developed by the Public Health Foundation of India (PHFI), was utilized to obtain a comprehensive account of all food and beverage items consumed by the participants on the day preceding the interview. Detailed information was collected on the types, quantities, and timings of food consumption throughout the day. To ensure accuracy in estimating portion sizes, standard household measuring tools such as 5 ml and 15 ml spoons, and bowls with capacities of 50 grams, 100 grams, 150 grams, 200 grams, and 250 grams were used. These measuring aids were physically shown to the respondents, who were then asked to quantify their food intake in relation to these standard utensils.

The total intake of energy and macronutrients—including carbohydrates, proteins, and fats—was computed by summing up the nutritive values of each reported food item using the **DietSoft** software, a nutritional analysis tool. The calculated intakes were compared with the Recommended Dietary Allowances (RDA) prescribed by the Indian Council of Medical Research (ICMR). According to ICMR guidelines, the RDA for energy intake for an average Indian reference woman engaged in moderate physical activity is 2230 kilocalories per day. For analytical purposes, an intake of energy that was equal to or greater than 80% of the RDA (i.e., ≥1784 Kcal) was considered adequate (above -2 standard deviations), whereas energy intake below 80% of the RDA (<1784 Kcal) was classified as deficient (below -2 standard deviations).

Statistical analysis of the collected data was performed using **Microsoft Excel 2007**, **SPSS (Trial Version 21)**, and **DietSoft**. These software tools facilitated data cleaning, tabulation, and statistical computations for deriving frequencies, means, and nutritional inferences. The methodology was structured to provide a comprehensive understanding of dietary intake patterns among tribal women and to assess the prevalence of nutritional inadequacy in this vulnerable population group.

Results

The study population comprised women from three Particularly Vulnerable Tribal Groups (PVTGs)—namely the Khonds, Gadabas, and Porijas—as well as six other non-PVTG tribal communities. The age-wise distribution of participants, as shown in Table 1, reveals that 11.1% of the women were between 15 and 20 years of age, a majority (64%) belonged to the 21–30 years age group, and 19.6% were aged between 31 and 40 years. A significant proportion of the study participants (approximately 60%) were illiterate, while 12.9% had attained education up to graduation level or higher.

In terms of employment status, 28% of the women were homemakers or unemployed, whereas the remaining 72% were engaged in various forms of work. Regarding socioeconomic classification, 41.3% of the women were identified as living below the poverty line. The religious affiliation of the participants showed that a majority (78.7%) practiced Hinduism, while 21.3% identified as Christians.

Tables 2 and 3 provide insights into the frequency of food consumption and dietary practices of tribal women, as assessed through both the Food Frequency Questionnaire (FFQ) and the 24-hour dietary recall method. Rice emerged as the principal staple food, while **Ambali**—a traditional fermented gruel—was the most commonly consumed breakfast item. The top five food items contributing to daily caloric intake were Rice, Ambali, Vegetables, Tea with Milk, and Dal.

Table 2 further illustrates that almost all women (99.1%) consumed rice on a daily basis, and a significant majority (75.6%) reported daily consumption of ragi, a millet rich in calcium and fiber. In contrast, wheat consumption was negligible. Among pulses, red gram (tur dal) was the most commonly consumed variety, with 96.9% of participants reporting its intake; 46.2% consumed it at least three times per week. Conversely, black gram was less popular—only 24% reported consuming it in the previous week, while 76% had not consumed it at all.

Vegetable intake was relatively high, with 83.5% of participants consuming them at least three times per week. Green leafy vegetables were consumed with similar frequency by 66.2% of the women. With regard to cooking oils, the use of saturated fats, particularly palm oil, was reported by 63.9% of the participants, compared to 36.1% who used other types of cooking oils.

In terms of animal-based food sources, 64.4% of women reported consuming flesh foods (meat or fish) once a week, while 41.3% consumed eggs weekly. Only 20% of participants consumed these protein-rich foods more than three times per week. Alarmingly, nearly one-third of women (44.9%) did not consume milk at all. Fruit consumption was moderate, with 52.5% reporting intake at least three times per week.

Consumption of processed and ready-to-eat foods was relatively low among the study population. Approximately 63.1% of the women reported never consuming preserved foods (such as homemade pickles and dried meat), and only 11% consumed commercially packed foods (like biscuits or snacks) three or more times a week.

When examining household food practices, it was found that a vast majority (89%) of the women shared their meals with other family members, while the remaining 11% reported eating only after other members had finished. Alcohol consumption was reported among 13.3% of the participants.

Nutrient Intake

The average daily energy intake among the tribal women was found to be 1931 kilocalories (Kcal). As illustrated in Figure 1, carbohydrate consumption was notably high, with an average intake of 367.14 grams per day, contributing approximately 76.6% of the total energy. Protein intake averaged 49.83 grams daily, accounting for 10.5% of energy, while fat intake was 27.67 grams, contributing 12.9% of total caloric intake.

According to the Indian Council of Medical Research (ICMR), the recommended daily allowance (RDA) for energy for a moderately active adult woman is 2230 Kcal. An energy intake of less than 80% of the RDA (i.e., <1784 Kcal/day) is considered nutritionally inadequate. As depicted in Figure 2, 37.8% of the participants consumed energy below this threshold, indicating a significant prevalence of caloric deficiency.

Similarly, the RDA for protein for a reference Indian woman weighing 55 kg is 55 grams per day. Protein consumption below 80% of this value (i.e., <44 grams/day) was also considered inadequate. The study found that 40.9% of participants had protein intakes below this cut-off, further underscoring the prevalence of nutritional inadequacies among the study population.

Discussion

This study highlights important dietary patterns and nutritional trends among tribal women in the Integrated Tribal Development Agency (ITDA) Kotaramachandrapuram division, West Godavari (Eluru) district. The data indicates that rice and ragi are the predominant cereals consumed in this population. The preference for these grains can be attributed to their local cultivation by the tribal communities, which enhances accessibility and affordability. These findings align with observations from multiple earlier studies that reported similar dietary trends among tribal populations across India (5–11).

Among pulses, red gram (tur dal) was clearly favored and widely consumed, with 96.9% of the women including it in their diets, often in the form of traditional preparations like dal and pappucharu. In contrast, black gram was consumed by only about 32% of the women, indicating relatively lower preference or availability. The frequency of pulse consumption, however, remained low, with most women consuming them just once or twice a week. This limited frequency has been similarly reported in previous nutritional assessments conducted in tribal regions (7–9,12). The Integrated Tribal Development Agency's 1993 report also documented persistently low pulse consumption across different seasons (10).

The use of cooking oils showed a noticeable trend towards the consumption of saturated fats, particularly palm oil. Palm oil is often preferred in tribal households due to its lower cost when compared to other refined oils. However, excessive intake of saturated fats poses long-term cardiovascular risks, warranting awareness and potential public health intervention.

On a positive note, the intake of vegetables—particularly green leafy vegetables—was encouraging. A large majority (85.6%) of the women reported consuming vegetables at least three times per week, and 66.7% included green leafy varieties. These vegetables are often locally cultivated or foraged, making them accessible and affordable. Fruit consumption was moderate, with 52.4% of women reporting intake three or more times per week, primarily relying on seasonal and indigenous fruits such as jackfruit and mangoes. These findings are consistent with those of Ray SK, Agrahar-Murugkar D, and Qamra SR, who also noted similar consumption patterns among tribal and rural populations (8,12,13).

The intake of animal-source foods such as red meat, poultry, and eggs was observed to be less frequent than vegetable intake. Typically, these items were consumed once a week, most commonly following local market days (shandies), which serve as primary sources for purchasing meat and eggs. Red meat was consumed by 64.4% of the women at least once a week, while egg consumption was reported by 41.3% with the same frequency. Fish and seafood consumption was notably rare, and in some villages like Gammeli, fish consumption is culturally prohibited, stemming from traditional beliefs that local deities guard the aquatic life, thereby making its consumption taboo.

Milk consumption was notably low, with 44.9% of participants reporting that they had never consumed milk. This trend is rooted in cultural beliefs, such as the taboo against milking cows, prevalent among certain tribal groups. Similar findings have been documented in earlier studies, indicating a longstanding pattern of dairy avoidance among tribal populations (6–9,12–15).

Traditionally, tribal communities have preserved food items—especially meats and fruits—for later use during lean seasons, such as the monsoons when hunting and forest access become difficult. However, the practice of preparing and consuming homemade preserved foods has declined. In the present study, 58.2% of women reported that they never consumed such foods, indicating a gradual shift away from indigenous food preservation practices.

Alcohol consumption remains part of tribal cultural practices. Typically, locally brewed alcoholic beverages like toddy (Jeeluga Kallu) are consumed. In the present study, 13.3% of women reported regular alcohol consumption, a relatively low figure compared to historical norms. This reduction may reflect the influence of education, social awareness, and evolving cultural attitudes. The majority of women appeared to reserve alcohol consumption for special occasions or

festivals. Similar observations were made by Kusuma YS et al., who reported festival-based alcohol consumption among tribal women (14).

The nutritional analysis of the study population reveals significant findings. The mean daily calorie intake was found to be 1930 kilocalories, which represents approximately 86.5% of the Indian Council of Medical Research (ICMR) recommended dietary allowance (RDA) for moderately active adult women (2230 Kcal/day). This implies a caloric deficit of around 13%. Comparable results were reported by Kupputhai U et al., who found a 20% deficit in energy intake among tribal women (16). Other studies also highlight widespread caloric insufficiency, with deficits ranging from 38% to 50% across various tribal groups (6,9,17).
Carbohydrates made up the majority of the caloric intake. The mean daily carbohydrate consumption was 367 grams, translating to approximately 1468 Kcal, which constituted 76% of the total energy intake—consistent with standard nutritional guidelines. Protein consumption averaged 49.8 grams per day. Given the recommended protein requirement of 1 gram per kilogram of body weight, and the energy contribution of proteins being advised at 10% of total daily intake, the observed intake was adequate. With each gram of protein contributing 4 Kcal, a woman with a daily energy requirement of 1930 Kcal would require at least 48.25 grams of protein. Hence, the reported intake of 49.8 grams meets the nutritional requirement. Adequate protein intake was similarly documented in studies by Agrahar-Murugkar D and Laxmaiah et al. (6,18). Nevertheless, some studies, including that by Kupputhai U et al., have identified a 30–40% deficiency in protein intake among tribal women (16), indicating regional variation.

Fat intake among the study participants averaged 27.6 grams per day, contributing about 248 Kcal, which constituted 12.9% of the total energy intake. This falls within the recommended range, where fats should provide 10–30% of total caloric intake. Although the quantity of fat consumed was adequate, the quality of fat—predominantly from saturated sources—may pose health risks in the long term. These findings contrast with those of Laxmaiah et al., who reported a 47% deficit in total fat consumption among tribal women in Khammam district (6).

Conclusions

The present study reveals significant gaps in the dietary practices of tribal women residing in the ITDA Kotaramachandrapuram division. The findings indicate a marked deficiency in the consumption of pulses and unsaturated oils, both of which are essential for a balanced and nutritious diet. The predominance of saturated fats, particularly palm oil, coupled with the limited intake of protein-rich pulses like black gram, underscores a nutritional imbalance. Additionally, socio-cultural factors and traditional beliefs appear to influence dietary choices, as evident in the widespread food taboos that restrict the consumption of milk and milk products. Nearly one-third (37.8%) of the women were found to consume less than 80% of the recommended daily allowance (RDA) for energy (i.e., 1784 Kcal/day), and approximately two-fifths (40.9%) of the participants consumed protein in amounts below 80% of the RDA (i.e., less than 44 grams/day). These findings point to underlying nutritional inadequacies that could have long-term implications for women's health, especially in reproductive age groups.
The presence of traditional food taboos, limited dietary diversity, and suboptimal intake of macro- and micronutrients emphasizes the urgent need for targeted nutritional education and behavioral change interventions. Enhancing awareness among tribal women about the nutritional value of different food groups, debunking dietary myths, and promoting culturally acceptable alternatives can contribute to improving the overall health and nutritional status of this population.

Recommendations

In light of the findings from this study, it is strongly recommended that focused health and nutrition education programs be implemented within the tribal communities, particularly targeting women and adolescent girls. These programs should aim to address and dispel common misconceptions and food taboos that hinder the consumption of nutritionally valuable items such as milk, eggs, and certain pulses.

Frontline health workers, including Accredited Social Health Activists (ASHAs) and Auxiliary Nurse Midwives (ANMs), should be trained and empowered to conduct regular community-based nutritional awareness campaigns. These initiatives should include culturally sensitive counseling sessions, cooking demonstrations using locally available and affordable food items, and the dissemination of simple, understandable information on balanced diets.

Moreover, efforts should be made to integrate these educational interventions into existing maternal and child health programs, school health initiatives, and women’s self-help groups to enhance outreach and sustainability. Collaboration with community leaders and village elders will be essential to ensure acceptance and community participation in overcoming traditional barriers to optimal nutrition.

Acknowledgement
We extend our sincere gratitude to the Additional District Medical and Health Officer (DM&HO) of the Integrated Tribal Development Agency (ITDA), Kotaramachandrapuram Division, for their invaluable support and facilitation of this study. We are also deeply thankful to the Medical Officers, field health staff, and personnel of the Primary Health Centres (PHCs) in the study region for their active assistance, coordination, and cooperation throughout the course of data collection.

Our heartfelt appreciation goes to the women who participated in this study, for their time, patience, and willingness to share personal and household-level dietary information. We also acknowledge the unwavering support and encouragement provided by the village heads and community elders, whose collaboration was instrumental in gaining the trust and participation of the study population.

Their collective contributions have played a crucial role in the successful completion of this study, and we are truly grateful for their involvement.

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