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Mapping Meal Patterns Across Food Groups Using a Mixed Methods Approach Among Tribal Communities of Anjaw District in India

Pooja Singnale
singnalepooja37@gmail.com

ICAR Research Complex for NEH Region

Surjya Kanta Roy
Indian Council of Agricultural Research

Soibam Peter Singh
ICAR Research Complex for NEH Region

Debasis Sasmal
ICAR Research Complex for NEH Region

Raghavendra Pandurangi
National Institute of Nutrition

Ugarsain Sangwan
ICAR Research Complex for NEH Region

SuryaGoud S Chukkala
National Institute of Nutrition

Naveen Khoisnam
ICAR Research Complex for NEH Region

Satveer Yadav
ICAR Research Complex for NEH Region

Keshab Gogoi
ICAR Research Complex for NEH Region

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Abstract

Tribal communities in India remain nutritionally vulnerable due to geographic isolation, limited dietary diversity and poor access to balanced foods. The Anjaw district of Arunachal Pradesh, characterized by difficult terrain and fragile food systems, represents one such high-risk area where evidence on dietary practices remains limited. This study explored dietary meal patterns among 160 participants in Anjaw district using a 24-hour dietary recall method. Food items were grouped into twelve food groups and analysed across four daily meals: breakfast, lunch, snack and dinner using correspondence analysis to assess associations and consumption patterns. Additionally, qualitative insights were gathered through key informant interviews to understand how environmental, socio-economic and cultural factors influence dietary patterns. Results showed a strong dependence on cereals, roots and tubers, vegetables, oils and fats, reflecting a carbohydrate-rich diet with limited variety. Meal preferences were highest for lunch, followed by dinner, breakfast and snacks. Lunch was the most nutrient-rich meal, including pulses and occasional animal-source foods while breakfast and dinner were mainly cereal-based. Qualitative findings revealed that low income, limited accessibility, availability and cultural preferences reinforced reliance on staple and low dietary diversity. The findings highlight both dietary and contextual factors influencing dietary patterns in this study. To improve dietary diversity and nutrient intake; interventions should diversify the Public Distribution System (PDS) with fortified staple and pulses, strengthen ICDS through locally available nutrient-dense foods and promote kitchen gardens and small livestock rearing to ensure sustainable nutrition security aligning with Sustainable Development Goal Zero Hunger and Good Health and Well-being for inclusive growth.

1. Introduction

Adequate nutrition is the cornerstone of health, growth and human development Yet, malnutrition persists globally in multiple forms- undernutrition, micronutrient deficiencies and the growing prevalence of overweight and obesity. Together, these burdens not only contribute to infectious diseases but also accelerate the incidence of non-communicable diseases (NCDs) such as diabetes and cardiovascular disorders. The Global Nutrition Report (2021) highlights that nearly half of all deaths among children under five are attributable to undernutrition, while diet-related NCDs have become leading causes of adult mortality [1]. This triple burden of malnutrition threatens to overwhelm low- and middle-income countries where rapid dietary transitions, environmental changes and socioeconomic inequalities intensify nutritional vulnerabilities [2, 3].

India reflects these global challenges in a striking manner. Despite substantial progress in food production and poverty reduction, malnutrition remains widespread. National survey (NFHS-5, 2019–21) indicate that 36% of children under five are stunted and more than half of women of reproductive age suffer from anemia [4]. At the state level, the situation in Arunachal Pradesh mirrors these national patterns. According to NFHS-5 (2019–21) anemia is a significant concern, affecting 40.3% of women aged 15–49 years and 56.6% of children aged 6–59 months. Whereas 28% of children under five are stunted, while 15.4% are underweight and 13.1% are wasted [5]. Alongside persistent undernutrition, the

consumption of calorie-dense, nutrient-poor foods has fuelled rising rates of overweight, obesity and noncommunicable diseases [6, 7].

Over 100 million tribal people live in India, making up about 8.6% of the country's overall population. Tribal people face severe challenges due to geographic isolation, socioeconomic marginalization and limited access to healthcare and markets (8). Consequently, they experience disproportionately higher rates of maternal and child undernutrition, anemia and child mortality [9].

Dietary practices within tribal communities are shaped by subsistence farming, forest resources and strong ecological dependence. Staples such as rice, coarse grains, roots and tubers dominate daily meals, while the intake of pulses, fruits, dairy and animal-source foods remain limited [9, 10]. These dietary imbalances perpetuate protein-energy malnutrition and micronutrient deficiencies, particularly iron deficiency anemia among women and adolescents [11, 12, 13]. Infants and young children are at heightened risk of stunting, wasting and impaired cognitive development due to inadequate complementary feeding [14, 15]. At the same time, increasing exposure to processed and packaged foods, often high in fat, sugar and salt, has introduced new risks of overweight and diet-related NCDs even in populations historically burdened by undernutrition [16, 17, 18]. Recent evidence from India shows that ultra-processed foods are increasingly displacing traditional diets, supported by market expansion and aggressive marketing strategies [19, 20].

In light of these evolving dietary transitions and persistent nutritional disparities, achieving the Sustainable Development Goals of Zero Hunger (SDG 2), Good Health and Well-being (SDG 3) and Responsible Consumption and Production (SDG 12) necessitates a comprehensive understanding of dietary patterns and meal structures that shape nutrition outcomes. Against this backdrop, this study explores what foods are consumed and how meals are organized across the day among tribal households in Anjaw district of Arunachal Pradesh, India. Beyond quantitative assessment, it incorporates qualitative insights to examine how environmental, socioeconomic, cultural and policy factors influence food access and consumption pattern. Integrating both perspectives provides a holistic understanding of diet and consumption pattern. With dearth of studies that have examined meal-wise food group distribution between breakfast, lunch, dinner, and snack in this tribal setting, such an approach aims to identify dominant consumption choices and existing nutritional gaps thereby providing evidence for context-specific interventions and policies targeted at vulnerable tribal populations.

2. METHODOLOGY

2.1 Study Location:

The present study conducted in Anjaw district, located in the easternmost part of Arunachal Pradesh, is characterized by nutritional vulnerability owing to its unique geographical and socio-economic constraints. The region has limited cultivable land, frequent natural hazards such as heavy rainfall, landslides and inadequate infrastructural facilities, which restrict both food availability and accessibility. These structural challenges contribute to a fragile food system, leading to poor dietary diversity, limited

intake of micronutrient-rich foods and a high prevalence of undernutrition among women and children [21].

2.2 Quantitative Data Collection:

Sample size was calculated based on the formula

$$n = \frac{4PQ}{L^2}$$

Where P was anemia among women of reproductive age group, which was 35.9% (4). For a 25% relative error and design effect of 1.4, the sample size was calculated as 153, which was rounded off to 160. Efforts were made to ensure that the findings were representative of the entire district. The Anjaw district consists of 305 villages divided into eight administrative circles. So, two villages were selected from each circle by simple random sampling through lottery, resulting in 16 study villages. From each selected village, 10 households were surveyed, leading to a total sample size of 160 male and female participants (8 circles × 2 villages × 10 households). Within each village, the first household was chosen randomly from the Anganwadi household register and subsequent adjacent households were visited consecutively until the target number was reached [22]. This approach ensured a balanced distribution of samples across all regions of the district while maintaining feasibility in field data collection. One person among the consenting adults in the household was selected using KISH grid method.

Participants were informed about the objectives and procedures of the study and written informed consent was obtained from all participants before data collection. Dietary intake was measured using the 24-hour recall method, which involves conducting structured interviews to gather specific information on all foods and beverages ingested the previous day [23]. Food intake data was divided into twelve different food groups and four meal categories: breakfast, lunch, snack and dinner. To avoid bias arising from a typical consumption pattern, data were collected on regular days, excluding festival periods, fasting days or special occasions.

2.3 Qualitative Component:

In addition to structured quantitative dietary data, this study conducted qualitative analysis through key informant interviews to understand broader contextual factors that influence food consumption patterns among participants. Data was collected on themes such as availability and accessibility of food, socioeconomic status, education and nutrition awareness, cultural practices and participation in government food and nutrition schemes. The thematic analysis explored how these elements potentially shape dietary patterns, especially in the context of tribal settings where food environments and socioeconomic constraints are critical determinants of dietary diversity.

2.4 Statistical Analysis:

All responses were systematically tabulated into a 12 × 4 contingency framework and analysed using correspondence analysis, a multivariate statistical technique widely applied for visualizing associations within categorical data. While correspondence analysis effectively maps dietary preferences, it is subject to certain limitations such as scaling biases and disproportionate emphasis on infrequent events. To ensure robustness and reliability, data collection was carefully executed using a structured interview schedule, thereby enhancing representativeness and accuracy of the findings.

- **Data Preparation:** A contingency table of 12 × 4 was constructed to organize food group consumption across the four meal categories.
- **Expected Frequencies:** Expected values for each cell were computed using the formula:

$$\text{Expected Frequency} = \frac{\text{Row Total} \times \text{Column Total}}{\text{Grand Total}}$$

- **Chi-Square Statistic:** The chi-square value was derived by applying the formula:

$$\chi^2 = \frac{\sum(O-E)^2}{E}$$

where *O* represents the observed frequency and *E* the expected frequency.

- **Row and Column Profiles:** Profiles were generated by dividing the observed frequency of each cell by its corresponding row or column total, providing the relative contribution of each category.
- **Singular Value Decomposition (SVD):** The chi-square matrix was decomposed using SVD, yielding eigenvalues and eigenvectors that defined the analytical dimensions.
- **Contributions and Associations:** The degree of association between food groups and dimensions was assessed. Category contributions reflected the extent to which each group influenced variation, while cosine values indicated the closeness of categories to particular dimensions.
- **Result Visualization:** A perceptual map was generated to graphically represent dietary preferences across food groups, allowing clearer interpretation of associations.

3. RESULTS

The socio-economic profile of respondents (Table 1) revealed that the average age was 37.7 years, with more than half (52.5%) belonging to the middle-aged group, representing the economically and physically active population. Female participation (54.4%) was slightly higher than male (45.6%), reflecting notable involvement of women. Agriculture remained the dominant livelihood source, with 54.4% engaged in primary occupations, while secondary (36.3%) and tertiary (9.4%) activities contributed

to household income. Nuclear families (69.4%) were more prevalent than joint families, with smaller household sizes being more common, largely due to economic constraints and changing lifestyles. Education levels were generally low, with 63.8% attaining only primary education and 33.8% remaining illiterate. The average operational landholding was 1.3 ha, with most respondents (68.8%) falling under smallholder categories, which translated into low annual incomes (<1 lakh for 58.8%). Farming experience was also limited, with nearly half (45.6%) reporting less than 10 years of involvement in agricultural activities.

Table 1: Socio-economic indicators of the respondents

Socio-economic indicator	Description	Category	Frequency	Percentage (n=160)	Mean
Age	Chronological age of respondent	Young (18-30)	51	31.88	
		Middle(31-50)	84	52.50	37.75
		Old (51 and above)	25	15.63	
Gender	Gender of the respondents	Male	73	45.63	
		Female	87	54.38	
Occupation	Primary, secondary and tertiary occupation of the respondents	Primary	87	54.38	
		Secondary	58	36.25	
		Tertiary	15	9.38	
Type of family	Structure or composition of family of the respondents	Nuclear	111	69.38	
		Joint	49	30.63	
Family size	No. of family members of the respondents	Small	99	61.88	
		Medium	49	30.63	
		Large	11	6.88	
Educational qualification	Level of education pursued by the respondents	Illiterate	54	33.75	
		Primary school	102	63.75	
		Secondary	3	1.88	
		Graduate and above	1	0.63	
Operational land holding	Size of cultivable land owned by respondents	Small (up to 1 ha)	110	68.75	
		Semi Medium (1-2 ha)	32	20.00	1.30
		Medium (2-4 ha)	9	5.63	
		Large (4 and above ha)	9	5.63	
Farming experience	No. of years spent in farming	Below 10 years	73	45.63	
		10-15 years	58	36.25	
		15 years and above	29	18.13	

Annual Income	Income earned by the respondents from different sources	Low (Below Rs 1,00,000/-)	94	58.75
		Med (Rs 1,00,000-5,00,000/-)	61	38.13
		High (Rs 5,00,000 & above)	5	3.13

Table 2 provides a summary of the observed frequencies and residuals for food group consumption throughout the four daily meals: breakfast, lunch, snack and dinner. Cereals, roots and tubers, vegetables, oils and fats emerged as the most consistently consumed food groups across all meals. Conversely, food groups such as fish and seafood, eggs, meat, poultry and fruits were among the least consumed.

Table 2: Observed frequency and residual values of food group consumption across the four meals.

Food groups	Breakfast	Lunch	Snacks	Dinner
cereals	98	160	0	160
Roots & Tubers	98	160	0	160
Vegetables	61	160	0	98
Fruits	0	80	39	0
Meat, Poultry	0	58	0	71
Eggs	0	42	39	33
Fish& Seafoods	0	24	0	21
Pulses, Legumes,nuts	0	144	0	160
Milk &Milk Products	67	41	93	36
Oils/Fats	83	160	123	160
Sugar/Honey	143	0	160	0
Others	0	0	0	0

Preferences for various food groups were highest for lunch followed by dinner, breakfast and then snacks represented in Figure3.

Figure 4 shows the standardised residual values for various food groups over the four daily meals. Positive residuals are represented by blue bars, indicating that the observed frequencies exceeded the expected values indicating a positive association between the respective row and column variables.

Conversely, negative residuals are shown in red, signifying that the observed frequencies were lower than expected, thereby indicating a negative association.

The correspondence analysis of the contingency table showed three fundamental dimensions. Dimension 1 accounted for 78.76% of the total variance, Dimension 2 contributed 15.54% and Dimension 3 contributed 5.69% (Table 3). Collectively, the first two dimensions captured 94.3% of the overall variance, suggesting that the data structure can be effectively represented in a two-dimensional space.

Table 3:Initial eigenvalues of dimensions and percentage of variance explained by dimensions

eigenvalue variance	Percent cumulative	variance. percent
Dim. 1 0.38145521	78.763882	78.76388
Dim.2 0.07527741	15.543480	94.30736
Dim.3 0.02756957	5.692639	100.00000

The scree plot (Figure 5) represents the eigenvalues in descending order, forming a characteristic curve. The elbow of the plot marks the point at which the eigenvalues begin to stabilize, indicating the optimal number of dimensions to retain. In this analysis, the elbow was observed after the second dimension, suggesting that the first two dimensions should be considered significant. Using these two dimensions for the biplot representation accounts for 94.31% of the total variance, leaving only 5.69% unexplained.

The compositional perceptual map in Figure 6 displays food group preferences throughout the four daily meals. The analysis shows a strong association of cereals, roots & tubers, vegetables, oils and fats with main meals breakfast, lunch, snacks and dinner. Breakfast and dinner were positioned closely to cereals, roots & tubers, vegetables, fats and oils indicating that these staples dominate the early and late meals of the day. This reflects a strong reliance on carbohydrate rich foods that provide sustained energy. Cereals, being staple foods among tribal communities, were consumed frequently across all meals, while roots and tubers (particularly potatoes) were commonly used as accompaniments. Vegetables, often consumed boil or cooked with cereals and tubers, formed an integral part of daily meals, serving as protective foods rich in vitamins and minerals. Oils and fats, widely used in preparation, appeared centrally located in the biplot, suggesting their widespread role in cooking practices.

Lunch clustered closely with pulses, legumes, nuts, meat and poultry, fish and seafood, highlighting the greater inclusion of protein-rich items during the midday meal. Such a pattern suggests that lunch serves as the major source of proteins and essential micronutrients needed for growth, repair and energy recovery. Snacks, on the other hand, were more aligned with sugar and honey, milk and milk products, eggs and fruits. Commonly consumed items included cakes, biscuits, buns, sweets, boiled eggs, omelettes, fruit salads and juices which act as lighter yet nutrient-dense options. These foods deliver quick energy, especially after exertion, thereby serving as convenient sources to bridge the gap between main meals while maintaining energy balance.

Table 4 presents thematic qualitative findings linking environmental, socioeconomic and policy factors to dietary patterns among participants. Limited food availability and accessibility were found to contribute to low dietary diversity, with diets largely dominated by easily accessible staples such as cereals, roots and tubers. Socioeconomic barriers, including low-income levels, small landholdings and limited affordability further restricted households' capacity to access and consume nutrient-rich foods. The study also revealed that limited education and low nutrition awareness, particularly among mothers were associated with poor food choices and inadequate child feeding practices, resulting in increased vulnerability to child malnutrition. While participation in government nutrition and food support schemes provided essential assistance but gaps in coverage and utilization persisted. Additionally, cultural food preferences preferred traditional rice-based meals contributing to carbohydrate-dense but micronutrient-poor diets.

Table 4:Thematic Analysis of Environmental, Socioeconomic and Policy Determinants Affecting Dietary Patterns

Theme	Indicators	Observations	Association with Dietary Patterns
Food Availability	Household access to fruits, vegetables, pulses, animal-source foods	Seasonal Scarcity of diverse foods especially fruits & animal foods	Low dietary diversity; predominance of cereal, roots & tuber crops
Food Accessibility	Distance to markets, transport options, affordability	Remote location, high travel time, low affordability, limited govt. transportation facilities	Preference for staples due to ease of access and reduced access to perishable foods
Socioeconomic Status (SES)	Household Income, landholding, occupation	Most households had low income; small landholding; limited affordability	Higher reliance on low-cost staples; less protein & micronutrient intake
Education & Nutrition Awareness	Maternal literacy, knowledge of balanced diets	Most mothers' primary education & Low awareness on balanced diets	Limited intake of nutrient-rich foods; inadequate complementary feeding
Government Schemes	Participation in ICDS/Anganwadi, Public Distribution System, Mid-Day Meal, Poshan Abhiyaan	Partial engagement; irregular access was reported	Schemes contribute to meals but gaps remain in diversity and quality
Cultural / Traditional Practices	Local food preferences	Strong preference for staples (rice) & traditional dishes	Reinforced cereal dominance & influenced meal pattern

4. Discussion

Dietary patterns in tribal communities are strongly shaped by the interlinking forces of environment, livelihood practices and sociocultural traditions. Unlike urban populations, where food diversity is determined by market-driven availability and consumer choice in remote hilly terrains subsistence agriculture and ecological constraints play a defining role [24]. At the household level, food consumption is further influenced by socioeconomic realities such as limited income, low levels of formal education and large family sizes, which often restrict dietary diversity and encourage dependence on staple crops and locally available resources [25, 26]. At the same time, cultural norms, community knowledge and food traditions sustain preferences for certain preparation methods and eating habits, thereby reinforcing continuity in dietary practices across generations [27.28].

The present study mapped dietary patterns within the tribal community, showing cereals, roots & tubers, vegetables, oils and fats as the most consistently consumed groups, while animal-source foods, pulses and fruits were least consumed due to limited availability, affordability and market access. Similar results were observed in other studies [29]. Among these, cereals emerged as the most prominent, with rice serving as the principal staple consumed across all three major meals. This centrality of cereals is not only a reflection of dietary preference but also of structural and cultural realities, as rice cultivation and consumption have historically shaped tribal communities [29, 30, 31]. Roots and tubers, particularly potato, sweet potato, cassava etc were the most frequently consumed items, reinforcing the pattern of dependence on carbohydrate-rich staples for daily energy needs. Earlier studies among tribal populations in North-East also reported high reliance on tubers and starchy foods, highlighting their affordability, availability and role in subsistence farming systems [32, 33]. Vegetables were mainly consumed as accompaniments to staple rice-based meals, with a clear cultural preference for simple boiled preparations over spiced or fried methods. These practices have been observed in tribal culinary traditions in north east India. Comparable dietary patterns have been observed among tribal populations in Arunachal Pradesh, vegetable intake was common but pulses, legumes and animal-source foods remained minimal [34, 35, 36, 37].

Beyond individual food groups intake, the structuring of meals revealed further insights into dietary behaviour. Meal preference patterns in present study showed lunch to be the most prioritized meal, followed by dinner, breakfast and snacks. This finding also aligns with Iranian adults, where legumes and meat dominated lunch intakes [38]. Lunch was protein-rich, clustering around pulses, legumes, nuts, meat and fish. A similar trend has been reported, where pulses and animal foods are significant contributors to midday meals [39, 40]. Pulses and legumes not only serve as key protein sources but also provide isoflavones, saponins and resistant starch, which help lower cholesterol, improve glycaemic control, reduce risks of diabetes and cardiovascular disease [41].

Whereas breakfast and dinner in our study were dominated by cereals, roots, tubers, vegetables, fats and oils reflecting traditional meal patterns among tribes. Similar findings were observed that the cereals especially rice, vegetables and tubers form core staples and are often consumed for most meals [42].

Similarly, these staples are widely consumed by many indigenous groups across North-East India, along with wild leafy vegetables rich in micronutrients [34, 35]. The contrast results were found that dinner tend to incorporate more animal-based food groups; unlike our setting, where late meals remain predominantly plant-based [29]. Vegetables and tubers consumed at these meals are important sources of fibre, carotenoids and polyphenols, which provide antioxidant and anti-inflammatory benefits, lowering risks of cardiovascular disease and certain cancers [43, 44]. Such reliance ensures dietary consistency but also reflects the limited diversification of food sources available in remote regions.

Whereas, snack patterns added another dimension to dietary diversity. Snacks in present study included sugar, honey, bakery products, milk products, eggs and fruits [45]. This is consistent with earlier evidence that tribal households in Northeast India rely on nutrient-dense traditional snacks, including fermented foods, fruits and dairy [46]. Similar findings have been reported in North and South Indian contexts, where snacks were often based on fruits and dairy [47]. Fruits and dairy not only enhance palatability but also provide vitamin C, calcium, polyphenols and bioactive peptides, which support metabolic health and bone strength [48, 49, 50].

Building on these quantitative insights, the qualitative analysis provided deeper understanding of the factors influencing individuals' dietary patterns. Limited food availability and accessibility, coupled with socioeconomic constraints, are key determinants of household food consumption pattern. Similar findings have been reported across low-income settings that low purchasing power and poor market access lead to monotonous, staple-based diets dominated by cereals, roots and tubers [51, 52]. Such diets are often deficient in micronutrients and protein increasing vulnerability to malnutrition. Evidence from Ethiopia and Bangladesh shows that households with limited resources and smaller landholdings have lower dietary diversity, prioritizing energy-dense staple foods over more costly nutrient-rich options such as fruits, vegetables and animal-sourced foods [51, 52, 53, 54]. These patterns reflect structural and economic barriers that restrict access to diverse foods, particularly in rural and resource-poor environments.

Education and nutrition awareness were also found to be major determinants of food choices and child feeding practices. Consistent with studies in Cambodia and India, higher maternal education and nutrition literacy have been linked to improved dietary diversity and reduced stunting in children [55, 56, 57]. Conversely, low nutrition knowledge among caregivers often leads to limited use of nutrient-dense foods, contributing to child undernutrition [58]. Although participation in government nutrition schemes provides important support, incomplete coverage and limited awareness reduce their potential impact [59, 60]. Moreover, cultural preferences for rice-based diets, similar to those reported in Asian Indian indigenous communities further reinforce carbohydrate-heavy consumption patterns [61]. The predominance of cereals and tubers, coupled with limited intake of pulses, fruits, vegetables and animal foods underscores a risk of dietary deficiencies particularly protein, iron, vitamin A, B complex vitamins and other micronutrients making it crucial for nutrition interventions and policies to strengthen dietary diversification and promote locally available nutrient-rich foods.

5. Conclusion

Dietary patterns of remote tribal communities at border areas remain heavily cereal-based, with limited intake of pulses, fruits, and animal-source foods, leaving them vulnerable to protein and micronutrient deficiencies. Strengthening government interventions is vital, particularly by expanding and diversifying the Public Distribution System (PDS) to include pulses, millets and fortified foods, alongside rice. Nutrition-sensitive schemes such as ICDS, Mid-Day Meal, and Poshan Abhiyaan should be better integrated with local food resources, while region-specific programs must support kitchen gardens, small livestock rearing, and community-based food processing. The qualitative findings highlight the need for integrated strategies combining economic empowerment, improved food system accessibility, nutrition education and culturally sensitive interventions to enhance food availability and dietary diversity. Targeted interventions for border tribal populations can reduce nutritional vulnerabilities while contributing to the achievement of several Sustainable Development Goals, including zero hunger, good health and well-being, poverty reduction, responsible consumption and production.

Declarations

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Authors Contribution:

PS; Conceptualization, Data collection and writing original draft. SKY; Methodology design and Statistical analysis. SPS; Validation of first draft, writing introduction and editing. DS; Supervision, validation & critical review of manuscripts. RP; Data interpretation and writing discussion. US; Field survey coordination and figure preparation. SGCS; Data analysis support, Figures, and Tables preparation. NK; Review of manuscript, Editing, and Formatting of manuscript. SY; Data entry, Validation, and Reference management. KG; Field survey coordination, data entry and formatting of references.

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Data Availability:

Raw data is provided upon reasonable request writing to the corresponding author.

Ethical Approval and consent to participate:

Ethics approval was obtained from the Scientific Advisory Committee (SAC) of ICAR - KVK, Anjaw. Study was conducted following all the guidelines of ICMR - NATIONAL ETHICAL GUIDELINES FOR BIOMEDICAL AND HEALTH RESEARCH INVOLVING HUMAN PARTICIPANTS (2017) and Helsinki Declaration. Informed Consent was taken from each participant. Data was de-identified and coded to improve participant privacy.

Consent for Publication:

Not applicable

Competing interest:

The authors declare no competing interests.

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Declaration of generative AI

During the preparation of this work, the author(s) used ChatGPT (free version 3.0) to make grammar checks and sentence improvements. After using this tool, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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Figures

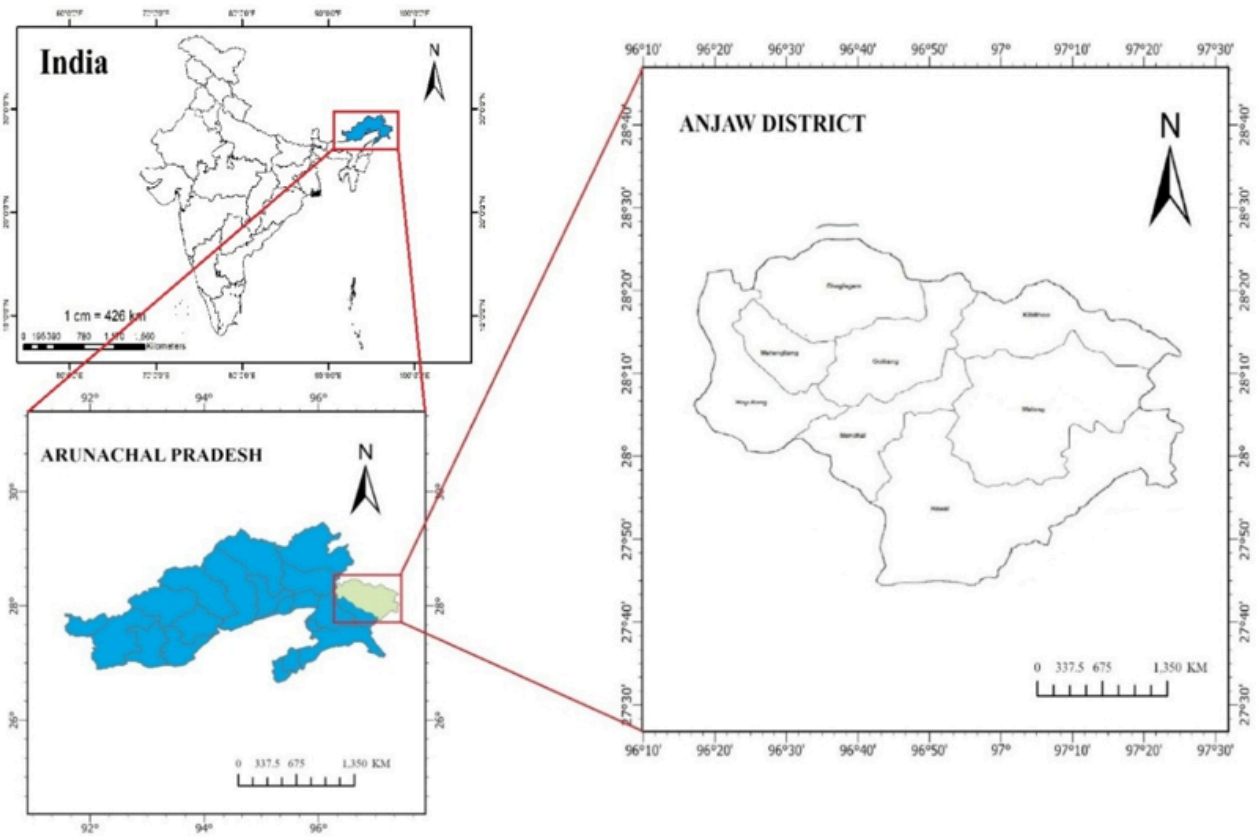


Figure 1

Study site, Anjaw district, Arunachal Pradesh (Source; ARC GIS 10.8 Software)

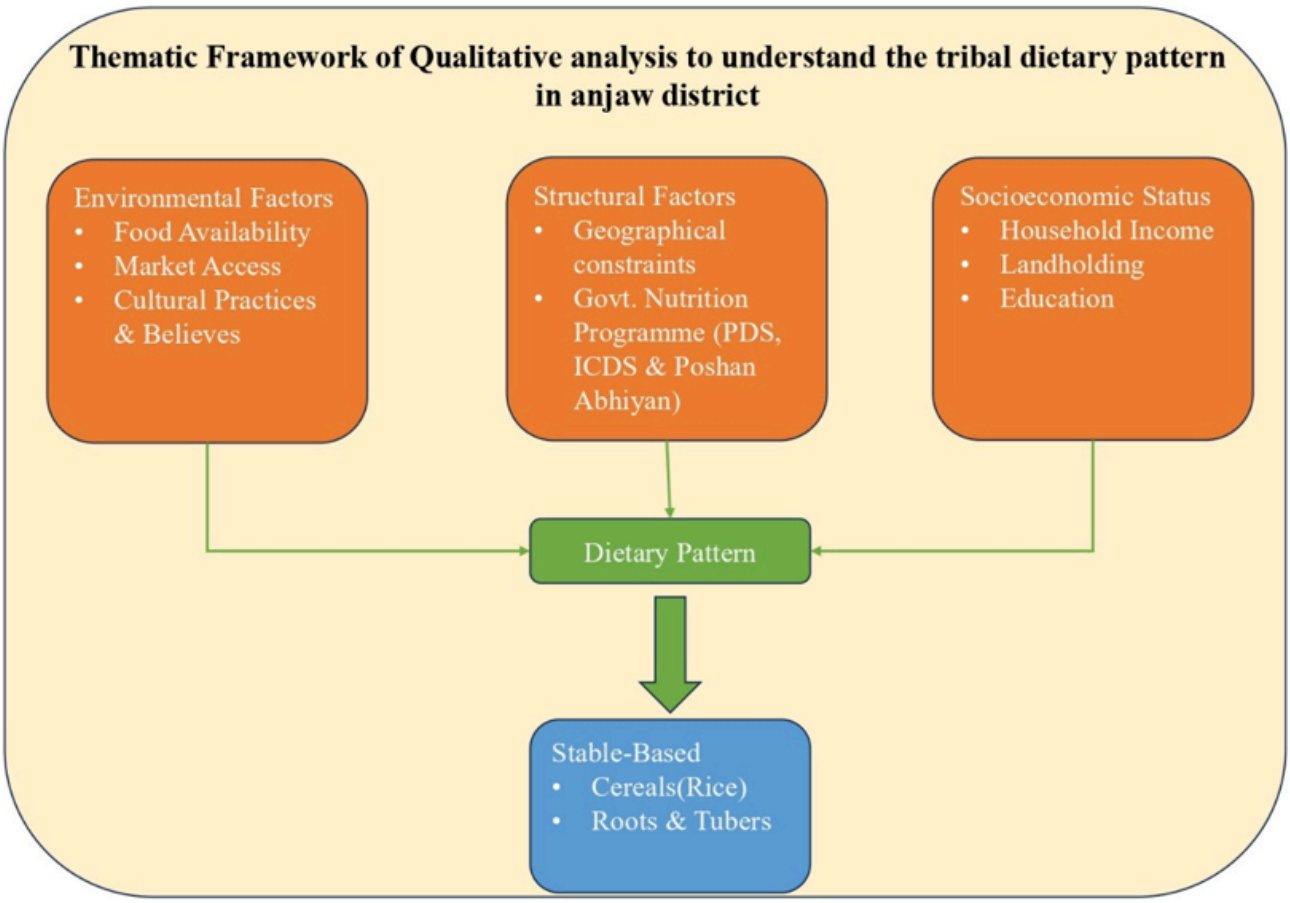


Figure 2

Thematic Framework of qualitative analysis to understand the tribal dietary pattern in Anjaw district

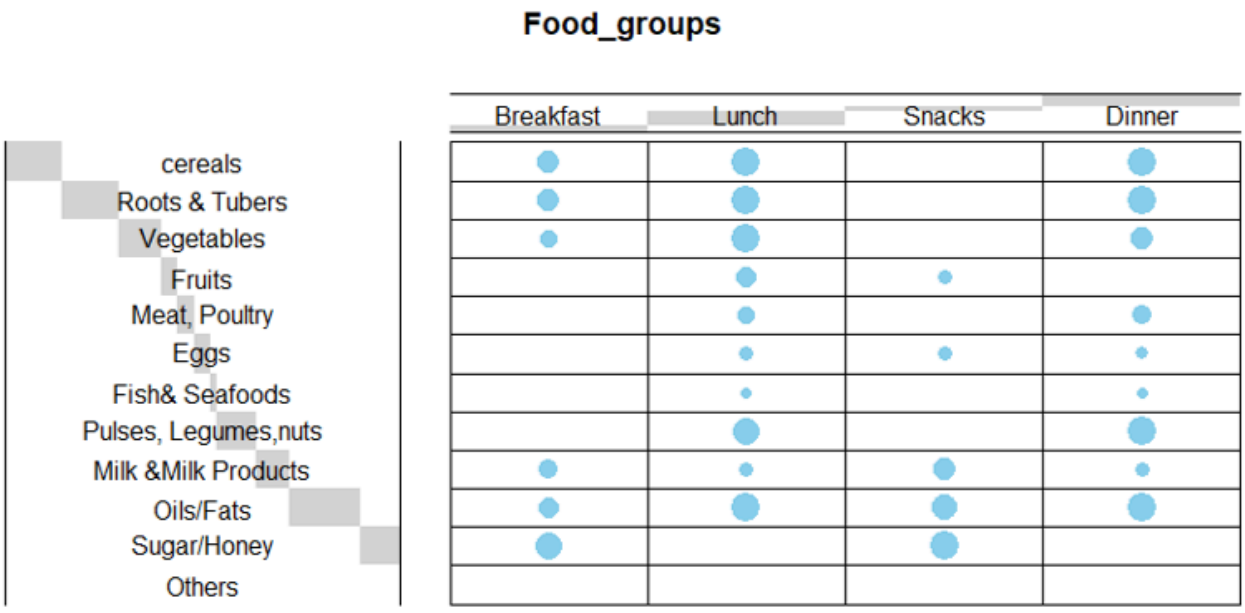


Figure 3

Preferences of various food groups among four meals

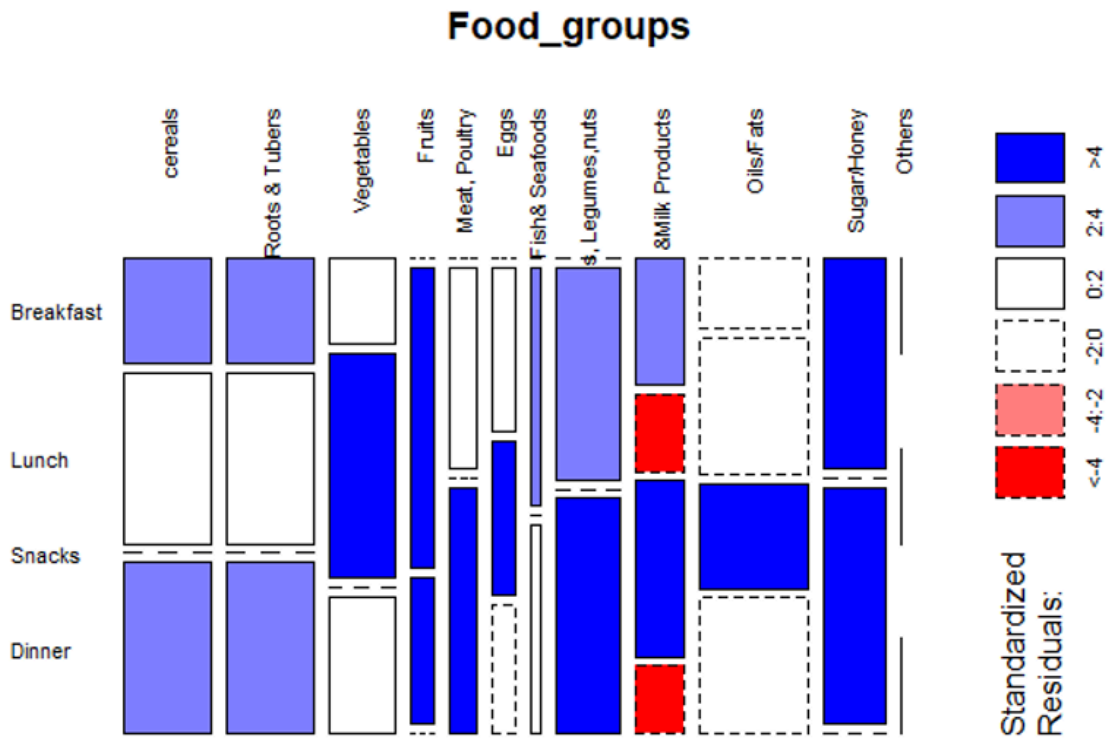


Figure 4

A mosaic plot of the standardized residuals of food group preferences.

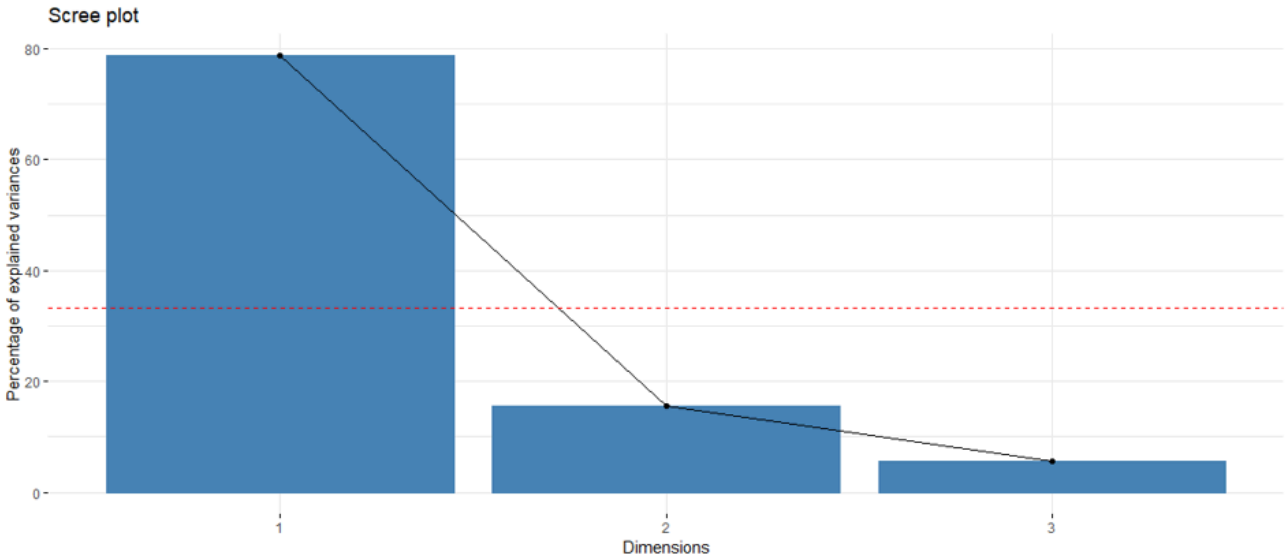


Figure 5

Screen plot of Dimensions

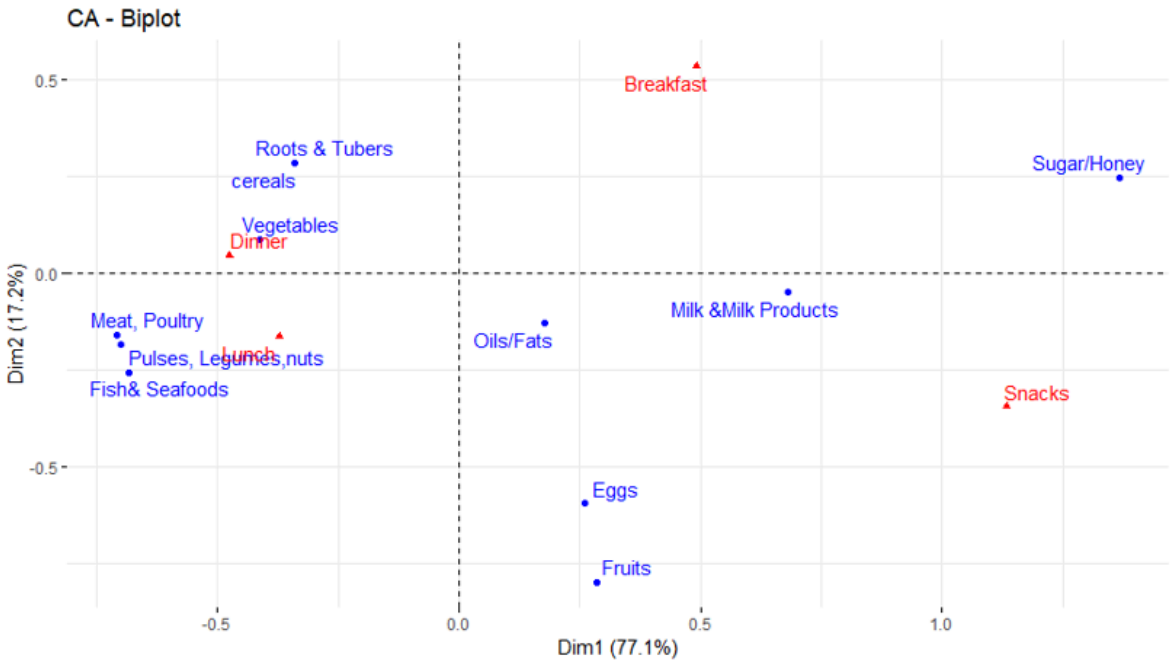


Figure 6

Compositional perpetual map of dietary preferences across the food groups