Exploring the **Implementation, Delivery, and Utilization of Various Interventions** Through **ICDS and Schools** Across **Telangana & Karnataka**: A Mixed Method Study

STUDY
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Disclaimer

Suggested Citation

Mahajan H, Parasannanwar D, R Venkateswarlu, Talari A, Varsha M, Lakshmi SB, Kumar PV. Exploring the Implementation, Delivery, and Utilization of Various Interventions Through ICDS and Schools Across Telangana and Karnataka: A Mixed Method Study; 2025.

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BACKGROUND

Malnutrition among children in India remains a major public health concern, contributing to impaired growth, cognitive delays, and increased vulnerability to infections. While national programs such as the ICDS and MDM scheme have expanded access to food, significant gaps persist in nutrient adequacy and dietary diversity-particularly in low-resource settings. Millets, particularly finger millet (ragi), offer a culturally acceptable and nutritionally rich option for supplementation. Ragi is naturally high in calcium, iron, fiber, and several essential micronutrients, making it well-suited for use in large-scale feeding programs. To address these nutritional gaps, a fortified ragi malt powder ('Sai Sure') enriched with essential vitamins and minerals was developed. The formulation aims to deliver a substantial portion of daily micronutrient requirements, supporting the nutritional needs of both undernourished and healthy children. This study was undertaken to assess the current landscape of nutrition interventions implemented through ICDS and school-based platforms in Karnataka and Telangana. It specifically examined the delivery, utilization, and acceptability of fortified ragi malt within these systems. The findings aim to inform policy and programmatic decisions for scaling up millet-based nutrition interventions.

OBJECTIVES

The project aimed to:

- Conduct nutrient analysis for Different Finger Millet samples: Ragi grain, Premium Ragi flour, Sprouted Ragi flour, Raw Ragi malt powder;
- Assess acceptability of the fortified ragi malt among target beneficiaries;
- Evaluate sensory attributes of fortified ragi malt using structured sensory evaluation protocols;
- Capture perceptions, facilitators, and barriers to implementation of nutrition interventions in schools and anganwadi centers via in-depth interviews (IDIs) with key stakeholders: CDPOs, supervisors, anganwadi workers (AWWs), school In-charges, parents, and students;
- Conduct structured household interviews to understand millet consumption patterns, barriers, and enabling factors;
- Provide actionable recommendations for programme integration and scale-up;

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Study Design and Population

A mixed-methods design was adopted to comprehensively evaluate the acceptability, sensory characteristics, and contextual determinants influencing the utilization of fortified ragi malt within existing nutrition programs. The study combined laboratory analyses, field assessments, and community-based inquiries across multiple sites in Telangana and Karnataka.

Nutrient analysis was performed on four types of finger millet samples: raw grain, premium flour, sprouted flour, and raw ragi malt powder to assess proximate composition and micronutrient profiles. The field-based acceptability assessment was conducted in two randomly selected Anganwadi Centres in Hamalbasti, Tarnaka, Hyderabad, catering to preschool children (3-6 years) from low-income households.

A laboratory-based sensory evaluation was undertaken at the ICMR-National Institute of Nutrition, Hyderabad, using a semi-trained panel of 15 research scholars. Product attributes, including appearance, aroma, texture, taste, and overall acceptability, were scored on a standardized 9-point hedonic scale under controlled conditions.

To understand implementation feasibility and community perceptions, in-depth qualitative interviews were conducted with CDPOs, supervisors, Anganwadi workers, school in-charges, parents, and students across Yadadri Bhuvanagiri and Mahbubnagar districts in Telangana, and Chikkaballapur and Raichur districts in Karnataka. These sites represented diverse rural, urban, and tribal settings. In parallel, structured household interviews were administered in the same districts to collect quantitative information on dietary practices, frequency and sources of millet consumption, barriers to use, and awareness of nutritional benefits. A total of 270 households in Telangana and 240 in Karnataka (equally from Chikkaballapur and Raichur) were surveyed.

Qualitative data were analyzed thematically using Braun and Clarke's six-phase reflexive framework, while quantitative data were summarized using descriptive statistics and mean hedonic scores to triangulate findings across methods.

RESULTS

Nutrient Analysis of different finger millet samples

- Raw Ragi malt powder showed lesser protein and higher total soluble sugars compared to other samples; fat, phytic acids, tannins, and diastatic activity were nearly equal across all samples

Sensory Evaluation

- Overall high acceptability: Scores for both variants were ≥8.0 across most attributes.
- Taste & aroma: Karnataka's milk-based K1 consistently outperformed Telangana's water-based T1.
- Texture: Smooth, lump-free preparations rated highest; thick or watery variations lowered scores.
- Aroma: Mildly lower in T1, linked to absence of milk fat aroma.

Acceptability Study

- Children generally consumed the full serving when preparation quality was optimal.
- For the ragi malt in mixed in water and jaggery, milk-based malt was associated with better satiety and preference.
- Caregivers reported willingness to continue product use (ragi malt mixed in water or milk), citing perceived energy boost and health benefits.
- Caregivers reported willingness to continue product use, citing perceived energy boost and health benefits.

In-Depth Interviews - Key Themes

Preparation Quality

- Critical factor for acceptance; improper mixing or incorrect viscosity reduced intake.
- Serving temperature influenced consumption, particularly in younger children.

Menu Rigidity & Waste

- Fixed menus created predictable dislikes (e.g., brinjal curry), causing avoidable waste.

THR/Balamrutham

- Monotony and large pack sizes encouraged diversion to other family members; occasional misuse in non-target foods.

Supply Chain

- Egg supply irregularities, storage challenges, and infrastructure deficits in kitchens and water supply.

Human Resources

- Helper (aayah) shortages increased workload; need for refresher training noted.

Digital Reporting Burden

- Multiple platforms and paper forms strained frontline workers' time.

Community Engagement

- Parents trusted frontline staff but wanted more menu variety and inclusion of fruits/snacks.

Agriculture-Nutrition Linkages

- Karnataka: Ragi-dominant production; limited seed availability for other millets.
- Telangana: Weak market linkages; lack of assured procurement discouraged farmer participation.

Structured Household Interviews

Sample Profile

- Telangana: n=272, mean age ≈38.7 years, 97% female respondents.
- Karnataka: n=240, mean age ≈41.7 years, 94% female respondents.
- Typical household size: 4-5 members.

Millet Consumption

- Any millet use: Telangana 90.8%, Karnataka 100%.
- Daily consumption: Telangana 83.5%, Karnataka 100%.
- Species mix:
  - Jowar: Telangana 86.8% vs Karnataka 56.2%.
  - Ragi: Telangana 82.7% vs Karnataka 68.3%.
  - Bajra: Telangana 28.7% vs Karnataka 43.3% (38% daily in Karnataka).
  - Little, foxtail, and barnyard millets: minimal use in both states.

Sources

- Telangana: Predominantly purchased (76.5%); own-produce 14.3%.
- Karnataka: Predominantly own-produce (59.6%); purchased 40.4%.

Barriers

- Telangana: Cost (5.5%), lack of awareness (55.9% reported as barrier), availability (18.4%).
- Karnataka: Availability (19.2%) and limited diversity; negligible cost concerns.

Awareness

- Telangana: 94.9% aware of nutritional benefits.
- Karnataka: 62.5% aware.

Suggestions for Scale-Up

- Telangana: Reduce price, ensure ration shop availability, increase awareness.
- Karnataka: Increase market availability, promote awareness, diversify seeds.

CONCLUSIONS

- Strong acceptability: Both variants well received, milk-based malt showing highest preference.
- Preparation quality: Consistency in viscosity, lump-free texture, and appropriate serving temperature are critical.
- Menu inflexibility: Contributes to waste; flexibility can enhance consumption.
- THR format: Large packs and monotony reduce adherence.
- Operational bottlenecks: Include supply chain weaknesses, kitchen infrastructure, and human resource gaps.
- Market and production patterns: Influence household millet consumption differently in the two states.
- Community willingness: High engagement potential if structured feedback loops are formalized.

RECOMMENDATIONS

Product & Preparation

- Adopt milk-based preparation where feasible.
- SOPs for viscosity, texture, and temperature.
- Introduce flavour variants and age-appropriate serving sizes.

Extension to Anganwadi Centres

- Given the high compliance and strong acceptability of fortified ragi malt across users, the product can be extended to other Anganwadi Centres.

Impact Evaluation Before Scale-Up

- Before scaling to other parts of India, conduct a robust impact evaluation including cost-benefit analyses to assess nutritional outcomes, feasibility, and economic viability.

Menu Diversification

- Weekly fruit and iron-rich snack inclusion.
- Flexibility for local substitutions.

THR Reform

- Smaller, nutrient-dense sachets with preparation instructions.
- Introduce flavour variants to improve compliance.

Supply Chain & QA

- Strengthen egg procurement, enforce weight and quality standards.
- Upgrade kitchen infrastructure and water facilities.

Human Resources & Capacity

- Fill helper vacancies.
- Regular refresher trainings for cooks and AWWs with practical demonstrations.

Digital Reporting

- Streamline reporting processes, enable offline data entry.

Community Engagement

- Establish school/ICDS food committees with parental involvement.
- Document and act on feedback.

Agriculture–Nutrition Convergence

- Telangana: Assured procurement and PDS inclusion.
- Karnataka: Expand certified seed access, promote decentralized millet processing.

INTRODUCTION

Malnutrition, particularly undernutrition and micronutrient deficiencies, continues to pose a serious public health challenge in India, affecting the health, development, and survival of children and women. According to the National Family Health Survey (NFHS-5, 2019-21), 35.5% of children under five are stunted (low height-for-age), 19.3% are wasted (low weight-for-height), and 32.1% are underweight (low weight-for-age) nationwide (1). These indicators reflect chronic and acute forms of malnutrition that can have long-term consequences on cognitive development, immunity, and productivity. Moreover, anemia, a key indicator of micronutrient deficiency, affects 67.1% of children aged 6-59 months, underscoring the need for focused nutrition strategies (1).

Despite the presence of longstanding nutrition programs such as the Integrated Child Development Services (ICDS) and the Mid-Day Meal (MDM) scheme, undernutrition and micronutrient deficiencies remain widespread (2, 3). These challenges are often attributed to inadequate dietary diversity, limited intake of nutrient-dense foods, poor bioavailability of critical micronutrients, and barriers in the acceptability, palatability, and delivery of nutritional supplements. To help bridge this gap, a fortified ragi powder has been developed and introduced through school and Anganwadi-based feeding platforms. This formulation builds on the nutritional strengths of finger millet (ragi), a traditional Indian millet inherently rich in calcium, iron, dietary fiber, and other micronutrients (4).

The fortified product combines these natural attributes with added essential vitamins and minerals to address nutritional inadequacies among young children, pregnant women, and lactating mothers. According to the label, each 10-gram serving provides approximately 31 kcal of energy, 1.6 grams of protein, and 0.97 grams of dietary fiber. It also supplies up to 25% of the daily recommended intake for critical micronutrients including iron, zinc, iodine, selenium, vitamin D, and B-complex vitamins (5).

Finger millet is especially suitable for such interventions due to its high nutrient density and versatility. On average, it contains 7.2% protein, 66.8% carbohydrates, 1.0% fat, 11.2% dietary fiber, and 2.5% minerals. Notably, it has the highest calcium content among all cereals and millets. Unlike polished rice or refined wheat flour, finger millet is typically consumed in whole-grain form, retaining the nutrient-rich outer layers. Its low-fat content and minimal lipase activity contribute to an extended shelf-life, making it ideal for distribution in large-scale feeding programs. Furthermore, the flour is highly adaptable, it can be used to prepare porridges, gruels, pancakes, steamed balls, and traditional items like idli and dosa, allowing it to suit diverse regional culinary preferences.

In addition to macronutrients and minerals, finger millet is a rich source of bioactive compounds such as ferulic acid and p-coumaric acid, predominantly found in its seed coat. These phenolic compounds offer antioxidant and anti-inflammatory benefits that are often absent in processed grains. The overall health-promoting properties of finger millet stem from its comprehensive nutrient profile and phytochemical richness, reinforcing its role as a promising vehicle for addressing the dual burden of undernutrition and micronutrient deficiencies.

To enhance community acceptability, the product is prepared differently across states. In Karnataka, the fortified ragi powder is administered with milk, promoting palatability and nutrient absorption. In Telangana, it is served using water and jaggery, which is culturally appropriate and more accessible in low-resource settings.

Recognizing the potential of this intervention, a formative research study was conducted in select districts of Telangana and Karnataka to assess the feasibility, acceptability, and implementation challenges of this millet-based nutritional supplement. The study employed a mixed-methods design, combining structured household surveys and in-depth qualitative interviews with key stakeholders, including parents, children, Anganwadi workers, school in-charges, CDPOs, ICDS supervisors, and district agriculture officials.

This comprehensive approach was intended to generate nuanced insights into millet consumption patterns, barriers and facilitators to utilization, and perceptions surrounding fortified products. Findings are expected to inform policy and practice, with the goal of scaling up the intervention within existing nutrition programs.

OBJECTIVES

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- Assess acceptability of the fortified ragi malt among target beneficiaries;
- Evaluate sensory attributes of fortified ragi malt using structured sensory evaluation protocols;
- Capture perceptions, facilitators, and barriers to implementation of nutrition interventions in schools and anganwadi centers via in-depth interviews (IDIs) with key stakeholders: CDPOs, supervisors, anganwadi workers (AWWs), school In-charges, parents, and students;
- Conduct structured household interviews to understand millet consumption patterns, barriers, and enabling factors;
- Provide actionable recommendations for programme integration and scale-up;

METHODOLOGY

Ethics and Permissions

The study received ethical clearance from the Institutional Ethics Committee of the National Institute of Nutrition (NIN), registered under EC/NEW/INST/2021/1206, and was conducted in accordance with NIN protocol number 02/IV/2024. Necessary administrative permissions were also obtained from the Departments of Women and Child Development in both Telangana and Karnataka prior to implementation.

Data Collection

To address the proposed research questions, we developed and utilized the following data collection tools:

- Nutrient analysis in Finger millet (Four finger millet samples): Ragi grain, Premium Ragi flour, Sprouted Ragi flour, Raw Ragi malt powder;
- Acceptability Study Proforma and Evaluation Tool - Designed to capture participant feedback on the palatability and overall acceptability of the product (Ragi malt mixed in water as well as milk);
- Sensory Evaluation Proforma and Assessment Form - Used to systematically assess the organoleptic properties of the product, including taste, texture, aroma, and appearance;
- In-Depth Interview Guides with Probes - Tailored for key stakeholder groups, including ICDS Officers, Child Development and Programme Officers (CDPOs), School In-Charges, Parents, Children, Anganwadi Workers, and the Director of Agriculture or other relevant district-level stakeholders. These guides explored perceptions of implementation, utilization, and challenges associated with nutritional interventions being implemented at schools and anganwadi centers;
- Structured Interview Questionnaire - Administered to assess household-level millet consumption patterns, accessibility, and related constraints;

Nutrient analysis of Different Finger Millet Samples

Germination of grains activates the metabolic machinery, which is required for cell multiplication to become future sapling. This process enhances synthesis of vitamins required for metabolic reactions, enzymes like diastase for breakdown of stored starch into maltodextrins and decrease in anti-nutritional factors like phytic acid and tannins. Four finger millet samples viz., Ragi grain, Premium Ragi flour, Sprouted Ragi flour, Raw Ragi malt powder submitted (by Sai Sure Annapoorna Trust) were analysed for nutritional and anti-nutritional factors using standard methodology at ICAR-IIMR, Hyderabad.

Nutrient Analysis of Product used for Acceptability and Sensory Evaluation Study

The proximate composition of the fortified ragi malt formulations was not directly analyzed in this study. Instead, nutritional values for energy, protein, fat, carbohydrates, vitamins, minerals, and phytic acid were adopted from the product label and cross-verified with standard values available in the Indian Food Composition Tables (IFCT) and relevant literature. This approach ensured consistency and reliability in the nutritional data used for estimating the percentage contribution to the Recommended Dietary Allowance (RDA) for preschool children. For the sensory evaluation and acceptability studies, fortified ragi malt formulations (coded as K1 and T1) were used. The nutrient composition of these products is provided in the corresponding table (Table 1).

Table 1. Nutrient Profile of the Fortified Ragi Malt Mixed with Milk and Water

Nutrient	K1 (fortified ragi malt with Milk) per 100 grams	% RDA	T1 (fortified Ragi malt without milk) per 100 grams	% RDA
Energy (kcal)	122.1	9.04	71.9	5.33
Protein (g)	3.36	20.12	0.77	4.61
Fat (g)	2.74	10.96	0.14	0.56
Carbohydrates (g)	20.85	15.44	17.05	12.63
Iron (mg)	1.54	14	1.49	13.55
Calcium (mg)	133.4	22.23	42.4	7.07
Vitamin A (mcg)	92	18.04	15	2.94
Vitamin D (mcg)	1.6	10.67	0.5	3.33
Total Sugar (g)	13.5	-	9.7	-
Added Sugar (g)	9.7	-	9.7	-
Sodium (mg)	37.6		5	

Preparation of Fortified Ragi Malt for Sensory Evaluation and Acceptability Study

Two fortified ragi malt formulations were developed and compared for ease of preparation and sensory acceptability. The K1 formulation included 10 g of fortified ragi mix, 18 g of milk powder, and 10 g of jaggery, while the T1 formulation had only 10 g each of ragi mix and jaggery. Both were boiled in water to yield a 100 g serving. The key difference was the addition of milk powder in K1, aimed at boosting protein and calcium content (Table 1).

To determine the optimal consistency for consumption and sensory assessment, fortified ragi malt was prepared by cooking 100 g of the premix with 2000 mL and 2500 mL of water, corresponding to 1:20 and 1:25 dilution ratios, respectively. These proportions were selected to standardize the preparation process and evaluate how varying levels of dilution affected texture, viscosity, and palatability. The 1:20 ratio was intended to produce a thicker consistency, potentially more suitable for young children, while the 1:25 ratio yielded a thinner formulation to assess ease of swallowing and overall sensory appeal. This standardization helped identify the formulation with the most acceptable consistency and mouthfeel for use in complementary feeding.

Sensory Evaluation using a Semi-trained Panel (Organoleptic evaluation by semi trained panel)

The organoleptic study was conducted at the National Institute of Nutrition (NIN) with a semi-trained panel of 15 members, comprising scholars from various divisions of the institute. Sensory evaluation of the two test recipes was conducted to assess individual acceptability based on various sensory attributes, including color, appearance, flavor, consistency/texture, taste, aroma, and overall palatability following the procedure given by Sri Lakshmi (2015). Each sample was prepared as gruel by mixing 100 g of the formulation with 2000 mL of water, maintaining the ratio. The reconstituted samples were coded (K1- ragi malt mixed with milk and T1 - ragi malt mixed with jaggery and water) and randomly presented to the panellists to avoid bias.

A 9-point hedonic scale was employed for the sensory assessment, where scores ranged from "dislike extremely" (1) to"like extremely" (9). This test enabled ranking of the samples based on individual preferences for each sensory parameter. The evaluation was carried out by a panel of 15 semi-trained participants, aged 21 to 40 years ensuring accurate perception of taste and aroma. Panellists were instructed to taste and rate each sample independently, using the 9-point hedonic scale to express their degree of liking or disliking for each sensory attribute. Puffed rice was used as a neutral palate cleanser, and clean water was provided for mouth rinsing to ensure accurate and independent evaluation of each sample during the sensory study.

Acceptability studies in Anganwadi children

Participants

Two Anganwadi centres (AWC1 and AWC2) were randomly selected for this acceptability study, both located in Hamalbasti near Tarnaka, Hyderabad. Functioning under ICDS, these centres cater to the health, nutrition, and early education needs of preschool children in low-income communities. Each centre was managed by an Anganwadi worker and a helper, with 20 children enrolled, aged 3-6 years. Facilities included a basic kitchen, storage for Take Home Ration (THR), and weighing scales for monitoring. Anganwadi children were receiving a daily hot-cooked mini meal, one boiled egg, and a nutri-snack under the supplementary nutrition component of the ICDS scheme. These Anganwadi centres served as a representative setting to assess the practical acceptability of fortified ragi malt formulations among preschool-aged children and their caregivers in a community-based context. At AWC 1, children were served K1 fortified ragi malt prepared with milk. At AWC 2, children received T1 fortified ragi malt prepared without milk. Each centre evaluated only one formulation to avoid bias and ensure consistency.

Delivery of the intervention, data collection and analysis

To facilitate this assessment, a smiley-based acceptability study was conducted using a 5-point scale featuring facial expressions ranging from "liked very much" to "disliked it”. The five-point smiley-based hedonic scale used for evaluating children's acceptability was adapted from validated methodologies developed for preschool populations (Guinard, 2000; Garg & Chadha, 2009), offering an age-appropriate and engaging way to assess food preferences. This child-friendly method offers a developmentally appropriate way to assess food preferences in young children who may not articulate responses using standard scales. It ensures reliable feedback and is well-suited for preschool and Anganwadi-based acceptability studies.

Before the tasting session, children were oriented to the scale using simple, relatable explanations and the investigators inquired with caregivers to determine whether the child had previously consumed any ragi-based products or had a known allergy to millets such as ragi. Caregivers were oriented about the fortified ragi malt and observed its administration to their children. Small, safe portions (100 g) of the two different test foods, fortified ragi malt with milk (K1) and fortified ragi malt with water (T1) were then served to the anganwadi children at their respective anganwadi centres. After tasting fortified ragi mix, the child was asked to point to the smiley that best expressed how much they liked it with facilitators ensuring neutrality by avoiding any prompts. Investigators then recorded the responses for each sensory attributes like appearance, colour, taste, flavour, texture, aroma, overall acceptability often converting them into numerical scores for analysis. The selected responses were documented and converted into numerical scores ranging from 1 to 5. Investigators also noted the left over, non-verbal cues, such as facial expressions or refusal to eat, to gain additional insights. These scores were then subjected to statistical analysis to evaluate the overall acceptability of the product and determine if any formulation adjustments were needed.

Acceptability studies in caregivers of Anganwadi children

A 9-point hedonic scale was administered to assess the sensory acceptability of the fortified ragi malt among caregivers of Anganwadi children by following the procedure given by Srilakshmi, B. (2015). The scale ranged from 1 to 9 where 1 indicated "dislike extremely" and 9 indicated "like extremely", capturing the degree of liking across sensory attributes such as appearance, colour, aroma, texture/ consistency, taste, flavour and overall acceptability.

For the study, 100 grams of fortified ragi mix (finger millet flour, milk powder, and jaggery) was cooked in 2000 ml of water by boiling and simmering for 15 minutes with continuous stirring. The prepared malt was then served warm in 100 ml portions to the participants. Caregivers were asked to taste the sample and independently rate it using the 9-point hedonic scale. Their responses were recorded and subsequently used for statistical analysis to evaluate the overall acceptability of the product and identify areas for sensory or formulation improvement.

These scores were subsequently analyzed statistically to assess the overall acceptability of the product and to identify areas requiring improvement or modification in the formulation and to quantify overall acceptability.

In-depth Interviews

The study was conducted across two Indian states: Telangana and Karnataka, encompassing diverse geographical settings, including rural, urban, and tribal areas. In Telangana, the districts of Yadadri Bhuvanagiri and Mehboobnagar were selected for data collection, which took place across multiple mandals such as Bhuvanagiri, Jadcherla, Mahaboobnagar, Choutuppal, Bhootpur, and Bommalaramaram. The Primary Sampling Units (PSUs) represented a balanced mix of rural (R), urban (U), and tribal (T) areas, ensuring socio-demographic and cultural diversity in the sample. Similarly, in Karnataka, the study was implemented in the districts of Chikkaballapur and Raichur, with coverage in mandals such as Shidlaghatta, Chikkaballapur Town, Gouribidanur, Gudibande, Devadurga, Manvi, Sirwar, and Lingasugur. These areas were chosen to capture contextual differences in nutritional practices and program implementation across rural and urban regions (Table 2).

To explore the lived experiences and perspectives of those involved in or impacted by nutritional interventions, in-depth qualitative interviews were conducted with a diverse range of stakeholders. Participants were purposively selected based on their direct roles in the implementation or utilization of nutrition-related programs. In Telangana, interviews were carried out with 2 senior district officials (DAO, Additional Collector, or Joint Director of Agriculture), 8 ICDS Supervisors, 3 Child Development and Programme Officers (CDPOs), 17 school in-charges, 17 Anganwadi teachers/workers, 16 parents of children attending school or Anganwadi centres, and 18 children themselves. Karnataka followed a similar sampling structure, with interviews conducted with 2 senior district officials, 12 ICDS Supervisors, 8 CDPOs, 16 school in-charges, 16 Anganwadi workers, 16 parents, and 16 children.

The inclusion of this wide range of stakeholders ensured that the study captured multiple dimensions of nutritional intervention spanning policy-level planning, programmatic coordination, frontline delivery, and end-user experiences. This multi-stakeholder approach enabled a comprehensive understanding of both barriers and facilitators to the implementation and uptake of nutritional programs, with a particular focus on millet-based interventions such as the fortified ragi mix.

All interviews were conducted using the Descriptive Phenomenological Method of Qualitative Analysis, aimed at eliciting rich, experience-based insights. Thematic saturation guided the sampling process, with interviews continuing until no new relevant information emerged. Interview guides were developed in consultation with behavioural and qualitative research experts, featuring stakeholder-specific questions and contextual probes designed to elicit depth and nuance. The objectives and thematic content of each stakeholder interview are summarized in the following section.

Table 2. List of villages visited in the state of Telangana and Karnataka

States	Telangana		Karnataka	
Districts	Yadadri Bhuvanagiri	Mehaboob Nagar	Chikkaballapur	Raichur
Taluk/Madal: PSU (R/U/T)	Bhuvanagiri: Chandupatla (R)	Jadcherla: Jadcherla (U)	Shidlaghatta: Hunasenahalli (R)	Devadurga: Devadurga (R)
	Bhuvanagiri: Bhuvanagiri (U)	Mahaboob nagar: Mahaboob nagar (U)	Chikkaballapur Town: Sultanpete (R)	Manvi: Manvi (U)
	Chotuppal: Chotuppal (U)	Bhootpur: Pothulamadugu (R)	Gouribidanur: Manchenahalli (U)	Sirwar: Sirwar (U)
	Bommala ramaram: Chouderpally, KK thanda (R)	Mahaboob Nagar: Fatehpur (R)	Gudibande: Gudibande (U)	Lingasugur: Lingasugur (R)
		Mohammadabad: Chinnaipally (T)		
Structured Interviews	120	150	120	120
Stakeholders Interviewed				
DAO/Additional Collector/ JDA	2		2	
Supervisor	8		12	
CDPO	3		8	
School-in-charge	17		16	
Anganwadi Teachers/Workers	17		16	
Parents	16		16	
Children	18		16	

PSU, Primary Sampling unit; R, Rural area; U, Urban area; T, Tribal area; JDA, joint director agriculture;

Director of Agriculture or other relevant district-level stakeholders

Main Objective: To understand millet availability, production dynamics, strategies for utilization, and dietary constraints.

- Explored regional availability and sourcing of different millet types.
- Investigated changes in production trends and influencing factors (e.g., policy, demand, climate).
- Probed challenges like infrastructure, land use, and water scarcity.
- Focused on promotion strategies, such as awareness campaigns and institutional use.
- Inquired about policy support, subsidies, and intersectoral collaborations.
- Explored current millet consumption patterns, cultural preferences, and barriers like cost and taste.
- Gathered views on consumer awareness of millet health benefits.
- Sought actionable recommendations for improving production, utilization, and policymaking.

Supervisor (ICDS Officer) Interview Guide

Main Objective: To assess implementation, utilization, and monitoring of nutritional interventions (e.g., fortified ragi mix) under ICDS and school systems.

- Identified active interventions and variations across geographies.

- Examined implementation status of fortified ragi mix and staff training.
- Explored monitoring mechanisms like field visits and review meetings.
- Evaluated accessibility challenges (e.g., distribution delays, supply shortages).
- Assessed beneficiary acceptability and cultural acceptance.
- Probed usage patterns and how interventions were consumed or repurposed.
- Documented challenges (e.g., staff shortages, community resistance) and opportunities (e.g., best practices).
- Requested feedback and recommendations for improving delivery and policy

CDPO Interview Guide

Main Objective: To explore the CDPOs' role in implementing, monitoring, and enhancing accessibility, acceptability, and utilization of nutrition programs.

- Provided an overview of nutritional programs by age/target group.
- Discussed CDPO responsibilities in implementation and coordination.
- Explored implementation specifics of fortified ragi mix, including feedback.
- Reviewed distribution systems and supply-chain bottlenecks.
- Gathered feedback on taste, cultural fit, and acceptability.
- Explored awareness strategies and stakeholder engagement.
- Looked at utilization patterns, including misuse or sharing.
- Identified implementation challenges (e.g., funding, logistics).
- Asked about existing monitoring tools, indicators, and evaluation metrics.
- Sought detailed policy and operational recommendations for scale-up.

School In-Charge Interview Guide

Main Objective: To understand school-level implementation, acceptability, and utilization of nutrition interventions among children.

- Documented ongoing interventions and integration in daily routines.
- Explored implementation of fortified ragi mix and training received.
- Examined monitoring and reporting mechanisms.
- Probed accessibility concerns and special group disparities.
- Evaluated child and parental feedback on interventions.
- Investigated cultural influences on acceptance.
- Studied consumption patterns, sharing, and compliance.
- Identified roles of teachers in reinforcing interventions.
- Captured challenges in logistics, administration, and communication.
- Documented community engagement and coordination with ICDS.

Parent Interview Guide

Main Objective: To gather parents' views on the awareness, access, and effectiveness of nutrition interventions delivered via ICDS and schools.

- Gauged parent awareness and source of information on interventions.
- Assessed understanding of the interventions' health purpose.
- Probed accessibility issues (e.g., delays, poor quality).
- Evaluated children’s feedback and cultural alignment.
- Explored how food was consumed, shared, or modified at home.
- Documented parental strategies to encourage children.
- Investigated perceived health and academic impacts.
- Sought suggestions for improvement and better parental engagement.

Child Interview Guide

Main Objective: To explore children's experiences, perceptions, and feedback about food received at school or Anganwadi.

- Asked about food types received and daily routine.
- Probed awareness of fortified ragi mix and preferences.
- Evaluated access regularity and adequacy.
- Gathered detailed feedback on taste, satisfaction, and energy levels.
- Explored behaviors around sharing, leftover food, or taking food home.
- Assessed parental influence on food habits.
- Documented perceived academic or health improvements.
- Invited child suggestions for food variety and involvement in food decisions.

Anganwadi Worker Interview Guide

Main Objective: To understand the frontline delivery, monitoring, and feedback processes for nutrition interventions.

- Listed key food interventions delivered (e.g., ragi mix, THR, eggs).
- Detailed methods of communication and food distribution.
- Described support received and coordination with supervisors and CDPOs.
- Reviewed feedback from children and families.
- Evaluated influence of cultural norms on food acceptance.
- Shared strategies used to encourage uptake and adherence.
- Tracked patterns of food use, compliance, and misuse.
- Discussed barriers in implementation (e.g., supply chain, geography).
- Proposed suggestions for better delivery, community engagement, and stakeholder support.

A female researcher with a background in nutrition and dietetics conducted all interviews in person. The interviewer had no prior relationship with any of the participants. Before each interview, the purpose and objectives of the study were clearly explained, along with the rationale for audio recording the session. Participants were given the opportunity to ask questions, and informed verbal consent was obtained prior to proceeding. To ensure privacy and encourage open dialogue, each interview was conducted in a setting where the participant was alone. Interviews lasted approximately 35 to 40 minutes. All sessions were audio-recorded and subsequently transcribed verbatim into Word documents.

For qualitative analysis, open coding was applied to the transcripts to systematically identify relevant concepts. Thematic analysis was then undertaken to explore participants' experiences and perspectives regarding nutritional interventions targeted at children, pregnant women, and lactating mothers in the states of Telangana and Karnataka. Code frequencies were compiled and analyzed using Microsoft Excel (2021 edition) to support the development of themes. Where appropriate, direct participant quotations have been included in the results section to enhance the credibility and transparency of the findings.

Structured Household Schedule: Dietary Patterns and Constraints in Millet Utilization

Structured household interviews were carried out in the same districts and mandals where the in-depth qualitative interviews were conducted. These interviews involved a significant number of participants across both Telangana and Karnataka, aiming to collect quantitative and demographic data on dietary habits and the challenges households face in millet consumption. In Telangana, a total of 270 structured interviews were conducted, while in Karnataka, 240 interviews were completed equally distributed between the districts of Chikkaballapur and Raichur. This comprehensive data collection offered a strong empirical base to understand millet consumption patterns, the reach of nutritional interventions, and the level of awareness within communities in both states.

The household schedule captured a range of information. It began with general household details such as the respondent's age, gender, household size, occupation of the head of the household, and location data, including village or ward, district, and state. It then assessed dietary patterns by documenting the frequency of millet consumption, the types of millets consumed (such as ragi, jowar, and bajra), commonly prepared millet-based dishes, and the usual sources of millets, whether through markets or self-production.

To understand constraints in millet utilization, the schedule explored barriers such as high cost, limited availability, and taste preferences. It also examined participants' perceptions regarding the health benefits or drawbacks of millets and assessed awareness about their nutritional value, including benefits such as fiber, calcium, and protein content. Respondents were encouraged to share ideas for improving millet use, including suggestions for reducing costs and increasing availability. Finally, the tool included a section for open-ended recommendations and additional feedback on how millets could be made more acceptable and accessible to communities.

As part of the structured schedule, a Millet Consumption Food Frequency Questionnaire (FFQ) was included. This component listed eight millet types Jowar, Finger millet (Ragi), Pearl millet (Bajra), Little millet, Foxtail millet, Kodo millet, Proso millet, and Barnyard millet. For each type, respondents were asked to report how often it was consumed, with options ranging from daily to never. The continuous variables are expressed as mean± standard deviation (SD); and categorical variables are expressed as frequency (Percentage).

Training

To ensure methodological rigor and consistency in data collection, a comprehensive three-day training program was conducted from 5th to 7th February 2025 for the field team involved in the formative research on the SaiSure nutritional product. The training aimed to familiarize team members with the study objectives, data collection tools, stakeholder-specific interview guides, and the contextual understanding of millet-based dietary practices.

The first day focused on introducing the study design and providing detailed orientation on the semi-structured interview guides developed for various stakeholder groups. The session included an overview of the study, followed by targeted training on guides for ICDS Officers, Child Development and Programme Officers (CDPOs), School In-charges, Parents, Children, Anganwadi Workers, and district-level agricultural officials. Each guide was discussed in detail, with emphasis on question structure, use of probes, cultural sensitivity, and maintaining consistency during field interviews. Breaks were provided throughout the day to encourage informal team discussions and peer learning.

The second day addressed the methodology for conducting sensory evaluations of the SaiSure product. The team was trained on administering taste tests, recording responses on attributes such as taste, texture, aroma, and overall acceptability, and standardizing evaluation procedures. Ethical considerations were emphasized, particularly in securing informed assent from child participants.

The final day included an institutional visit to observe millet processing and product development practices. This exposure enriched the team's understanding of the nutritional properties and innovations related to millet-based foods. In the afternoon, discussions focused on local dietary patterns and challenges in millet consumption, providing valuable insights that were incorporated into the adaptation of dietary assessment tools. This session also highlighted the importance of accounting for cultural and economic factors in evaluating the acceptability and utilization of millet-based interventions.

RESULTS

Nutrient analysis in Finger Millet (Four finger millet samples)

The protein content was low in Raw ragi malt powder (5.4%) compared to other samples (6.9-7.1%). Fat content was found to be in normal range generally seen in finger millet. Total soluble sugars that impart slight sweet taste to malted flours was found to be high (2.1%) in malted flour compared to other samples. Consistent pattern was not found for Tannin content in all the samples while malted samples were expected to have low tannin than raw samples.

Phytic acid content also did not show a clear pattern. Recent trails have shown better absorption of Iron from finger millet variety having 0.3% compared to 0.6 % phytate content. In any case the lower the phytate content, higher the bioavailability of minerals.

Table 3.0 Nutrient Analysis of four finger millet samples

Sample ID	Protein (%)	Fat (%)	Total soluble sugars (%)	Phytic acid (%)	Tannins (CE%)	Diastatic activity (U/g flour)
Ragi grain	7.1	1.5	1.3	1.1	0.18	2.2
Premium Ragi flour	7.1	1.3	1.1	0.8	0.25	2.3
Sprouted Ragi flour	6.9	1.5	0.5	1.0	0.63	2.3
Raw Ragi malt powder	5.4	1.1	2.1	1.2	0.39	2.2

Diastatic activity is a measure of activity of starch degrading enzymes that have developed in the malted flour due to the process of germination. Significant difference for diastatic activity were not found in the tested samples. Higher diastatic activity in malted flours assume significance during brewing process of malts where the enzymes help in degradation of starch and supply easily fermentable sugars to the microbes. However, diastatic activity is not much of significance for human consumption as the digestive enzymes in humans are very effective in degrading the macronutrients like carbohydrates, protein, and fat into their absorbable forms of simple sugars, amino acids, and fatty acids and glycerol respectively. Malting also increases digestibility of proteins and starch compared to native flours which might be useful in case of weaning foods for infants.

Sensory Evaluation Study

To assess the sensory quality and organoleptic appeal of the fortified ragi malt formulations, a sensory evaluation was conducted using a semi-trained panel.

Table 4.0 Sensory attributes of fortified ragi malt mixed with milk and water

Sensory Attribute	K1 (fortified ragi malt with Milk) n =15	T1 (fortified ragi malt without milk) n= 15
Appearance	7.16 ± 0.83	7.33 ± 1.23
Colour	7.33± 1.15	7.17± 1.19
Aroma	7.33 ± 0.98	6.17 ± 1.70
Texture/ consistency	7.67 ± 0.78	7.17 ± 1.34
Taste	7.83± 0.83	5.83 ± 1.59
Overall palatability	7.67 ± 0.78	6.33 ± 1.30

The sensory evaluation conducted with a semi-trained panel (n = 15 per group) revealed notable differences between the two fortified ragi malt formulations: K1 (with milk) and T1 (without milk), across several sensory attributes. Taste scores were significantly higher for K1 (7.83 ± 0.83) compared to T1 (5.83 ± 1.59), indicating a

strong panellist preference for the milk-based formulation ($p < 0.05$). This suggests that the inclusion of milk powder enhanced palatability, likely by improving flavour balance and mouth feel. Aroma also differed significantly, with K1 (7.33 ± 0.98) scoring higher than T1 (6.17 ± 1.70) ($p < 0.05$), reflecting better sensory appeal likely attributed to the milk's aromatic profile and interaction with jaggery. Overall palatability followed a similar trend, with K1 (7.67 ± 0.78) outperforming T1 (6.33 ± 1.30) ($p < 0.05$), reinforcing the preference for K1 as the more acceptable formulation (Table 4.0).

Attributes such as appearance, colour, and texture/consistency did not show statistically significant differences between the two formulations ($p > 0.05$), indicating that both were visually and texturally acceptable to the panellists. Based on panel member remarks, K1 (with milk) was generally preferred for its superior taste and texture, with terms like “better” and “very good” frequently used. T1 (without milk) was seen as less palatable, with suggestions for improvement. Overall, K1 demonstrated a slight sensory advantage in terms of flavour and acceptability (Table 4.0).

Acceptability of fortified ragi malt formulation K1

The results of the sensory evaluation and acceptability assessment of fortified ragi malt formulation K1 are presented in Table 4 & 5. Among all attributes assessed on a 5-point scale, appearance and texture received the highest mean scores of 4.27 ± 0.88, suggesting the product was visually appealing and had a child-friendly consistency. Colour and overall acceptability followed closely with mean scores of 4.22 ± 0.93, reflecting general satisfaction. Taste and aroma both scored 4.17 ± 0.95, while flavour received a slightly lower but still acceptable mean of 4.13 ± 0.83. Statistical analysis showed no significant differences ($p > 0.05$) among the sensory attributes, indicating consistent and uniformly favourable responses across all parameters. These findings demonstrate that the fortified ragi malt was well accepted by the children.

Acceptability of fortified ragi malt formulation T1

Results of the acceptability studies of the T1 formulation (fortified ragi malt without milk) among children at AWC 2 indicated high overall acceptability. On a 5-point scale, overall acceptability received the highest mean score of 4.46 ± 1.24, followed closely by aroma (4.40 ± 1.11) and the attributes appearance, colour, and taste, each scoring 4.35 ± 1.13. Flavour and texture were also well rated, with mean scores of 4.15 ± 1.05 and 4.10 ± 1.11, respectively. These results demonstrate that the fortified ragi malt was well received across all sensory parameters among Anganwadi children (Table 5.0)

Table 5: Mean Acceptability Scores of Fortified Ragi Malt Formulations (K1 and T1) Among Anganwadi Children

Attribute	K1 Fortified ragi malt with milk (n=20)	T1 Fortified ragi malt without milk (n=20)
Appearance	4.45 ± 0.51	4.53 ± 0.84
Colour	4.40 ± 0.50	4.53 ± 0.84
Taste	4.35 ± 0.49	4.53 ± 0.84
Flavour	4.30 ± 0.57	4.32 ± 0.75
Texture	4.45 ± 0.51	4.26 ± 0.87
Aroma	4.35 ± 0.49	4.57 ± 0.77
Overall Palatability	4.40 ± 0.50	4.63 ± 1.01

In comparison the sensory scores indicated that T1 (fortified ragi malt without milk) was slightly more favoured by Anganwadi children across most attributes. Specifically, T1 received marginally higher mean scores for appearance, colour, taste, aroma, and overall palatability compared to K1. This suggests that the simpler formulation of T1 may have been more visually and organoleptically appealing to young children. However, K1 (Forified ragi malt with milk) recorded a slightly better score for texture, indicating that the inclusion of milk powder may have contributed to a smoother or more familiar mouth feel. Despite minor differences, both products were generally well accepted, with all attributes receiving mean scores above 4 on a 5-point smiley scale, demonstrating high palatability among pre-schoolers.

Organoleptic evaluation of the fortified ragi malt by caregivers

The organoleptic evaluation of the fortified ragi malt by caregivers at (AWC 1) indicated a high level of acceptability across all attributes. Using a 9-point hedonic scale, texture received the highest rating with a mean score of 8.45 ± 1.72, reflecting strong approval of the product's consistency. Flavour and overall acceptability followed closely, both scoring 8.29 ± 1.71 and 8.29 ± 1.70, respectively. Appearance was also highly rated at 8.26 ± 1.76, along with colour (8.17 ± 1.69) and aroma (8.04 ± 1.66). Taste received the lowest score at 7.75 ± 1.63, though still within a favourable range. The narrow confidence intervals across all attributes suggest consistent responses, indicating strong overall acceptability of the product among caregivers (Table 6).

The sensory evaluation of the fortified ragi malt without milk by caregivers at AWC 2 demonstrated consistently high levels of acceptance across all parameters. On a 9-point hedonic scale, overall acceptability received the highest mean score of 8.25 ± 2.40, indicating strong overall satisfaction. Flavour (8.11 ± 2.31) and aroma (8.01 ± 2.33) were also highly rated. Colour and texture both scored 7.94 ± 2.27, while appearance and taste were rated at 7.86 ± 2.25 each. Although T1 showed slightly higher scores in most attributes, none of the differences were statistically significant ($p > 0.05$). These results indicate that both formulations were highly acceptable, with no significant preference between them from a sensory perspective.

Table 6. Mean Acceptability Scores of Fortified Ragi Malt Formulations (K1 and T1) among care givers of Anganwadi children

Attribute	K1 Fortified ragi malt with milk (n=20)	T1 Fortified ragi malt without milk (n=15)
Appearance	8.56 ± 0.90	8.45 ± 0.67
Colour	8.47 ± 0.67	8.54 ± 0.67
Taste	8.04 ± 0.77	8.45 ± 0.67
Flavour	8.61 ± 0.66	8.72 ± 0.66
Texture	8.78 ± 0.42	8.54 ± 0.67
Aroma	8.35 ± 0.65	8.64 ± 0.53
Overall Palatability	8.61 ± 0.58	8.91 ± 0.31

Results for the in-depth interviews

Telangana: District Agriculture Officer

Theme 1: Systemic Disincentives for Millet Production

Sub-theme 1.1: Absence of Market Linkages and Buyback Guarantees

“There should be a buyback system. Only then farmers will be encouraged.” (DAO)
Even though MSP (Minimum Support Price) technically exists, it's not perceived as reliable or adequate for millets, particularly compared to paddy.
“For paddy, there is an MSP. For millets, even if it's there, it’s very low.” (DAO)

Sub-theme 1.2: Marginalization of Departmental Functions

The DAO candidly discussed how flagship schemes like Rythu Bandhu (income support to farmers) have unintentionally undermined the traditional roles of agriculture officers.
“We are not doing our real jobs anymore. We’ve become insurance officers.” (DAO)
This institutional drift signals a shift from proactive technical extension to transactional roles, limiting millet promotion.

Theme 2: Cultural Shifts and Lifestyle Transitions

Sub-theme 2.1: Erosion of Traditional Dietary Practices

According to both interviews, even tribal communities, previously known for their millet-based diets, are transitioning to rice due to urban influence and ease of access.
“Even they are deviating from their traditional food habits.” (Additional Collector)

Sub-theme 2.2: Symbolic vs. Functional Awareness

While awareness about millet’s health benefits exists, it rarely translates into demand or practice.
“Yes, they are aware of nutritional benefits... but no proper market, so farmers are not showing interest.” (DAO)
“People know millets are healthy but can’t afford them or don’t find them easily.” (Additional Collector)

Theme 3: Institutional Constraints and Policy Gaps

Sub-theme 3.1: Limited Programmatic Support

The DAO emphasized that earlier, there were dedicated schemes for millet promotion such as seed distribution, equipment subsidies, and farmer training but most of these have lapsed.
“We used to run several schemes for millets… now they are not in implementation.” (DAO)
This signals a lack of continuity in programming despite policy-level attention.

Sub-theme 3.2: Dependency on Political Will and Direction

The Additional Collector argued that programmatic revival requires state-level political commitment. Without strong directives, district-level action remains sporadic.
“We require government trust and government direction first.” (Additional Collector)

Theme 4: Isolated Pockets of Practice and Consumption

Sub-theme 4.1: Tribal and Riverine Farming Pockets

Both officials referred to specific geographic niches - such as tribal communities near Turkapalli and farmers near the Moosi river - as exceptions where millet cultivation and consumption persist.
“Only towards Moosi river, farmers are growing millets.” (Additional Collector)
“In tribal areas… they grow it for their own use and consume it at home.” (DAO)

Sub-theme 4.2: Recipe Knowledge and Home-Level Retention

Despite low availability, millet recipes like Jowar Roti, Ragi Java, and Millet Upma were noted as being culturally retained.
“They prepare Millet Upma, Jawa, Roti - that’s what they usually make.” (DAO)
This culinary continuity offers a cultural entry point for millet promotion.

Theme 5: Recommendations for Revitalization

Sub-theme 5.1: Strengthening Market Ecosystems

Both officials agreed that seed subsidies, price assurance, and marketing channels are prerequisites for sustainable millet promotion.
“Provide seeds to the farmers and later buy the produce from them… like a guarantee.” (DAO)
“If government creates marketing channels, that would be very helpful.” (Additional Collector)

Sub-theme 5.2: Integrating Millets into Public Nutrition Schemes

Officials proposed mainstreaming millets into ICDS, PDS, and school-based schemes like MDM to generate demand.
“If millets are supplied through ICDS and PDS, both production and consumption will improve.” (DAO)
“Include millets in schools, hostels, and MDM programmes.” (Additional Collector)
This reflects a systems-thinking approach: using institutional channels to generate demand-side pull while stimulating supply-side response.

Telangana: ICDS Supervisor

Theme 1: Commitment to Grassroots Monitoring

Sub-theme 1.1: Daily Visits as a Core Supervisory Function

All supervisors emphasized the importance of in-person field visits, usually 2–3 centers per day. These visits involved checking menu adherence, preschool activities, hygiene, and stock logs.
“Every day, I try to visit at least two centers. We also check the attendance and records.” (Supervisor - 1)
Supervisors also performed surprise visits and engaged in home visits, especially for SAM/MAM children, to ensure proper use of Balamrutham.

Sub-theme 1.2: Supporting Anganwadi Teachers with App Usage

Supervisors actively helped teachers with app-based entries in NHTS and Poshan Tracker, especially where digital literacy or internet access was limited.
“We follow up even late at night to ensure the teacher has updated data in the app.” (Supervisor - 1)

Theme 2: Programmatic Strengths and Gaps in Implementation

Sub-theme 2.1: Reliable Meal Delivery but Gaps in Supplements

While most centers received rice, dal, and eggs regularly, Balamrutham and eggs were often delayed or received in suboptimal quality.
“We face problems with egg weight. Parents complain when they are smaller than 45 grams.” (Supervisor - 4)
“Suppliers ask for biometric before stock delivery, but sometimes they don’t come back.” (Supervisor - 6)

Sub-theme 2.2: Shortage of Helpers and Infrastructure Strain

A common concern was vacant Aayah (helper) posts, leading to Anganwadi workers cooking and serving food themselves while managing preschool activities.
“In some places, the teacher has to cook, teach, clean - it becomes too much.” (Supervisor - 3)
Supervisors expressed concern over lack of preschool play materials, poor sanitation infrastructure, and limited space in certain centers.

Theme 3: Challenges in Community Engagement and Compliance

Sub-theme 3.1: Resistance to Spot Feeding and Preference for THR

Supervisors consistently observed resistance from families who preferred receiving food at home rather than consuming it at centers - especially in urban or working-class households.
“Pregnant women ask for cooked food at home. But we insist they come to the center.” (Supervisor - 4)
“Some say - we never took food from Anganwadi, and we’re fine. Why now?” (Supervisor - 2)

Sub-theme 3.2: Cultural Beliefs and Selective Consumption

Supervisors described occasional dietary taboos, especially during religious months like Shravanmasam, when families avoided eggs.
“During some festivals, they take the egg home instead of eating it at the center.” (Supervisor - 6)
Others highlighted misconceptions, such as dal being harmful post-surgery — and responded with counseling and visual aids.

Theme 4: Record-Keeping and Digital Burden

Sub-theme 4.1: Pressure of Real-Time Data Upload

Supervisors described the dual burden of physical and digital reporting. App glitches, slow internet, and face capture technology led to frequent delays.
“Face capture doesn’t work when the signal is low. The teacher is frustrated.” (Supervisor - 8)
Supervisors also reported data manipulation by AWTs under pressure to meet targets when children were absent or migrated.

Sub-theme 4.2: Emphasis on Verification and Reconciliation

Supervisors described conducting headcounts and cross-verifying register entries with app data to ensure accuracy.
“We pick five children at random and check their weights against app entries.” (Supervisor - 7)

Theme 5: Evolving Training and Curriculum Needs

Sub-theme 5.1: Need for Regular and Practical Training

Supervisors called for refresher trainings, especially on preschool pedagogy, nutrition counselling, and mobile app usage.
“Teachers need more training in English and preschool activities under the new curriculum.” (Supervisor - 6)
Some had undergone trainings on millet promotion, including recipe demos during Poshan Maah and the International Year of Millets.

Sub-theme 5.2: Resource Deficits Impacting Learning

Supervisors noted that curriculum expectations had expanded, but support materials and staff were lagging behind.
“Children want to play, but there’s no outdoor play equipment.” (Supervisor - 2)

Theme 6: Nutrition-Specific Observations and Recommendations

Sub-theme 6.1: Balamrutham Acceptability and Misuse

Supervisors expressed concerns over monotony in Balamrutham flavor, its over-prescription in quantity, and its diversion for household use.
“Children can’t eat 100g of powder a day. The family ends up using it for dosa or laddu.” (Supervisor - 1)
“Balamrutham Plus is liked more, it could be given to all, not just SAM/MAM.” (Supervisor - 8)
Supervisors recommended smaller, nutrient-dense formats to increase compliance and reduce misuse.

Sub-theme 6.2: Integrating Ragi and Iron-Rich Snacks

Most supervisors supported the regular inclusion of Ragi Malt and iron-fortified snacks like chikki or laddu in the Anganwadi menu.
“Ragi malt is liked by children. If extended to Anganwadis, it would help.” (Supervisor - 8)
“Children have iron deficiency. Iron-rich snacks should be added.” (Supervisor - 6)

Telangana: Child Development Program Officer

Theme 1: Balancing Oversight with On-Ground Realities

Sub-theme 1.1: Dual Roles and Monitoring Pressures

CDPOs manage both field-level monitoring and administrative load, often balancing visits to 2–3 centers per day with digital supervision through Poshan Tracker and NHTS apps.

“Daily, we are supposed to visit two centers and also manage office work… If we find any gaps, I personally visit the center.” (CDPO - 2)

While digital tools provide oversight, face recognition and live app updates add burden to both AWTs and supervisors.

“Face capture is difficult. Teachers are struggling to upload data on time.” (CDPO - 1)

Sub-theme 1.2: Informal Audits and Community Feedback

CDPOs described using random phone calls, home visits, and event attendance as informal monitoring methods.

“We call beneficiaries and ask indirectly if they are getting the services.” (CDPO - 2)

They view community engagement as essential to evaluating programme success, especially for tracking dropouts and compliance.

Theme 2: Persistent Implementation Bottlenecks

Sub-theme 2.1: Infrastructure Deficits

CDPOs identified congested spaces, single-room Anganwadi centres, and lack of age-appropriate segmentation as major deterrents for attendance and program success.

“Most of the teachers are running the centers in a single room. That’s one of the main reasons for low attendance.” (CDPO - 2)

Sub-theme 2.2: Delays and Inconsistencies in Supplies

Issues with egg weight, Balamrutham stock, and logistics delays emerged frequently. Digital complaints through WhatsApp groups were common.

“Even if one egg is small, they take a picture and post it. We’ve told workers to return eggs below 45 grams.” (CDPO - 3)

CDPOs emphasized the need for consistent, quality-controlled delivery systems.

Theme 3: Beneficiary Resistance and Cultural Norms

Sub-theme 3.1: Refusal of Spot Feeding

Despite efforts, many pregnant and lactating women prefer take-home rations and avoid center visits due to logistical, social, or cultural reasons.

“They say they can’t walk 500 yards. After second delivery, carrying two babies to the center is impossible.” (CDPO - 1)

“Even rich people can’t afford eggs daily. But still, some won’t come due to ego.” (CDPO - 3)

Sub-theme 3.2: Household-Level Misuse

Misuse of food supplements like Balamrutham emerged as a concern. Family members often consume the ration or repurpose it into sweets or dosas.

“Mothers said they used Balamrutham to make laddus for the whole family.” (CDPO - 1)

Theme 4: Child-Centric Concerns and Program Coverage

Sub-theme 4.1: Uneven Reach Among Target Groups

While children aged 3–6 are largely covered, pregnant and lactating women were identified as less regular participants in spot feeding.

“Children are definitely getting all benefits. But for lactating women, attendance is patchy.” (CDPO - 3)

Sub-theme 4.2: Competition from Private Preschools

CDPOs observed a trend of parents shifting children from Anganwadis to private preschools, especially in urban areas, affecting enrollment and follow-up.

“As soon as the child speaks a few words, parents send them to private schools. Then we lose track of their development.” (CDPO - 2)

Theme 5: Reflections on Nutrition Intervention Design

Sub-theme 5.1: Quantity-Quality Balance in Meals

CDPOs reflected that serving large portions to pregnant women (rice, dal, egg, milk) might be nutritionally excessive or culturally incompatible.
“150 grams of rice, egg, dal, milk, it’s too heavy. Some say they can’t eat dal every day.” (CDPO - 1)
This calls for dietary revisions focused on nutrient density over volume.

Sub-theme 5.2: Recommendations for Balamrutham Reform

To improve acceptability and reduce monotony, CDPOs suggested age-specific formulations, flavor diversification (like fruit-based options), and packaging changes.
“Let it be like Cerelac different flavours by age group: banana, apple…” (CDPO - 3)

Theme 6: Strategies for Strengthening the ICDS System

Sub-theme 6.1: Partnerships and Innovations

Some CDPOs highlighted public-private partnerships, such as with HBL (a company that adopted centers), as models for enhancing menus with bananas, milk, and chikki.
“In HBL-supported centers, attendance is higher. Maybe millet chikki with jaggery can be added.” (CDPO - 2)

Sub-theme 6.2: Policy and Regulatory Suggestions

CDPOs recommended strict enforcement of school entry age norms to prevent premature migration of children to private schools, thus maintaining Anganwadi enrollments.
“If government strictly says no admission before 6 years, even private schools will have to follow.” (CDPO - 2)
They also called for a review of implementation policies, particularly those mandating presence for spot feeding, which may be impractical for certain populations.

Telangana: School-in-charges

Theme 1: Ragi Malt Integration and Student Reception

Sub-theme 1.1: Widespread Acceptance with Minor Resistance

SICs reported that Ragi Malt has been broadly accepted by students, especially when served regularly and prepared properly.
“Initially, some children resisted, but now they drink it happily.” (School In-charge - 4)
“Students say it gives them energy and keeps them full till lunch.” (School In-charge - 9)
Resistance was sometimes linked to taste or texture, but repeated exposure increased acceptance.

Sub-theme 1.2: Importance of Consistent Quality

Taste variations due to preparation inconsistency were a concern. Some SICs trained cooks specifically for Ragi Malt.
“We had to show the cook how to stir it continuously to avoid lumps.” (School In-charge - 15)
“If it’s too watery or thick, children throw it.” (School In-charge - 2)

Theme 2: Operational Challenges in Meal Implementation

Sub-theme 2.1: Menu Rigidity and Student Dislikes

SICs frequently mentioned that some menu items, especially brinjal curry, were consistently disliked.
“Children won’t eat on brinjal day. Even teachers complain.” (School In-charge - 11)
Despite suggestions made by schools, changes were rarely implemented because the menu is centrally fixed.

Sub-theme 2.2: Infrastructure Limitations

Many SICs reported inadequate space for dining, storage, or cooking. Rural schools especially struggled with ventilation and cleanliness.
“We cook in a shed with no proper roof. During rain, it’s a mess.” (School In-charge - 8)

“There is no separate room for storing Ragi Malt packets.” (School In-charge - 3)

Theme 3: Role of Teachers and Monitoring Practices

Sub-theme 3.1: Involvement in Food Supervision

Teachers play a key role in maintaining discipline during meals and ensuring equal distribution.
“We count students and servings before giving food to avoid wastage.” (School In-charge - 1)
Supervision also included checking food temperature, quality, and hygiene before service.

Sub-theme 3.2: Documentation and Digital Load

While SICs maintained physical records diligently, some expressed frustration over redundant or digital-only systems.
“We enter everything in the register and then again on mobile apps.” (School In-charge - 14)
“Signal issues delay reporting. We submit late sometimes.” (School In-charge - 10)

Theme 4: Parent-Teacher Collaboration and Community Perceptions

Sub-theme 4.1: Mixed Parental Feedback

Some parents appreciated school nutrition efforts, especially for low-income families, while others complained about food quality or menu repetition.
“Parents thank us for providing food, especially Ragi Malt.” (School In-charge - 6)
“Few parents say they send lunch because children don’t like curry.” (School In-charge - 12)

Sub-theme 4.2: Suggestions for Menu Diversity

Many parents expressed interest in including fruits, dry fruits, or snacks like groundnut chikki.
“We hear suggestions like adding bananas or eggs more often.” (School In-charge - 5)
SICs conveyed this feedback during monthly meetings but rarely saw follow-through.

Theme 5: Nutritional Education and Behavioural Impact

Sub-theme 5.1: Improved Food Habits and Nutrition Awareness

SICs observed that regular nutrition exposure influenced children’s food preferences and behaviors.
“Now children are asking parents to prepare Ragi Malt at home.” (School In-charge - 7)
“They discuss proteins and healthy food during science class.” (School In-charge - 13)
This demonstrates positive spillover from school to home environments.

Sub-theme 5.2: Role in Addressing Malnutrition

SICs used attendance records, weight monitoring, and field-level observations to track undernourished students.
“We identify thin children and counsel parents during PTMs.” (School In-charge - 16)

Theme 6: Aspirations and Strategic Suggestions

Sub-theme 6.1: Need for Flexibility in Menu Design

SICs proposed district-level flexibility in food planning to address local preferences.
“Let schools choose one curry each week to break the monotony.” (School In-charge - 3)
They suggested rotating vegetables, including seasonal fruits, and enhancing protein content.

Sub-theme 6.2: Enhanced Training and Incentivization

SICs called for refresher training for cooks and incentives for school staff involved in food monitoring.
“Cooking Ragi Malt is a skill. One session is not enough.” (School In-charge - 17)
“Mid-day meal duty should be recognized; it takes time and effort.” (School In-charge - 13)

Telangana: Children

Theme 1: Value and Acceptance of School Nutrition

Sub-theme 1.1: Nutritional Awareness and Gratitude

Many students clearly articulated why they receive Ragi Malt and MDM - to support their health, concentration, and classroom engagement.

“If we drink Ragi Malt, we feel full and we can concentrate in class.” (Student - 1)

“Government is giving this because we are poor, and many don’t get breakfast at home.” (Student - 11)

Several reported a growing acceptance and liking of Ragi Malt over time, especially after getting used to its taste.

“At first it was different, but now we feel good after drinking it.” (Student - 4)

Sub-theme 1.2: Experiencing Physical Benefits

Children described increased energy levels and reduced hunger after consuming the fortified mix.

“We don’t feel hungry until lunch if we drink Ragi Malt.” (Student - 2)

“The day we drink Ragi Java, we feel energetic and interested in classes.” (Student - 3)

These reflections underline the physiological relevance and psychosocial impact of nutrition in the learning environment.

Theme 2: Palate, Preferences, and Participation

Sub-theme 2.1: Clear Likes and Dislikes

While many enjoyed Ragi Malt, rice, and potato curry, brinjal curry emerged as the most disliked item, repeatedly mentioned across interviews.

“I don’t like brinjal curry. Most students don’t.” (Student - 6)

“If possible, please remove brinjal curry from the menu.” (Student - 7)

Conversely, dishes like khichdi, jeera rice, and egg were widely appreciated.

“Jeera rice and dal are my favourites.” (Student - 15)

Sub-theme 2.2: Wanting a Say in the Menu

Several students reported giving feedback through teachers or mid-day meal committees but noted that changes were rare due to a rigid weekly menu.

“We tell teachers, but changes are not made.” (Student - 8)

“Even if we suggest something, ayahs don’t change it.” (Student - 18)

This highlights a gap between participatory structures and actual responsiveness in meal planning.

Theme 3: Role of Teachers and School Infrastructure

Sub-theme 3.1: Monitoring and Meal Management

Students credited teachers and ayahs for timely food distribution and portion control. Teacher monitoring was particularly emphasized during meal times to prevent wastage.

“Teachers monitor us when we eat Ragi Malt.” (Student - 3)

“They serve food as soon as the interval bell rings.” (Student - 5)

Meal distribution processes were generally described as efficient, with many schools using pre-counting methods based on daily attendance.

Sub-theme 3.2: Ayahs as Critical Agents

Ayahs (helpers) were appreciated for their efforts in cooking and serving, though some students felt their responsiveness to feedback was limited.

“Ayahs serve food for us, but they don’t always listen when we complain about taste.” (Student - 6)

The relationship between students and service staff is respectful but somewhat hierarchical, reflecting broader systemic norms.

Theme 4: Socioeconomic and Household Contexts

Sub-theme 4.1: Limited Home Food and Parental Encouragement

A significant number of children mentioned not having breakfast at home, making school meals vital.
“Sometimes we don’t eat anything at home. School food helps.” (Student - 13)
Parental support for school meals was high. Parents were perceived as encouraging, even when home preparation of Ragi Malt was infrequent.
“My parents tell me to eat everything served at school.” (Student - 9)
“My mother prepares Ragi Malt for me on Sundays.” (Student - 18)

Sub-theme 4.2: Continuity at Home

Several children mentioned reproducing Ragi Malt at home, either with jaggery or salt, especially in summer.
“We prepare it in the morning during holidays.” (Student – 14)
“I myself know how to make it with jaggery.” (Student – 6)
This crossover from school to home signals the potential for sustained dietary habits.

Theme 5: Wastage, Feedback, and Responsibility

Sub-theme 5.1: Wastage due to Taste or Over-Serving

Despite general appreciation, wastage was reported due to over-serving or dislike of specific items.
“Some students take extra and then throw it.” (Student - 17)
“If I don’t like the curry, I ask them to serve less.” (Student - 8)
Students shared food with peers or discreetly discarded it when necessary, often without informing adults.

Sub-theme 5.2: Student Feedback Systems

While several schools-maintained feedback books or involved students in meal committees, there was a sense of futility around it.
“We write in feedback books, but the menu never changes.” (Student - 15)
“Teachers ask us, but ayahs follow the same menu.” (Student - 18)

Theme 6: Aspirations and Suggestions

Sub-theme 6.1: Requests for Improvement

Many students wanted more variety, better curry taste, and the inclusion of fruits.
“Bananas, apples or oranges would be nice.” (Student - 5)
“Earlier, we had rasam and curd. We miss those.” (Student - 5)
“Dry fruits can be added to Ragi Malt.” (Student - 13)
Such suggestions reflect a nuanced understanding of taste, nutrition, and dietary diversity.

Sub-theme 6.2: Inclusivity and Fairness

There was a shared belief that all students should benefit from such interventions, with some expressing pride in equitable access.
“Everyone gets food here that’s the best part.” (Student - 16)
“We feel happy to eat together.” (Student - 13)
This underscores how school nutrition programmes are not just about food they foster inclusivity and community identity.

Telangana: Parents

Theme 1: Value Attributed to School Nutrition

Sub-theme 1.1: A Source of Essential Daily Nutrition

Parents widely recognized the importance of school meals, especially in households facing economic hardship. The daily provision of food, particularly Ragi Malt and eggs was seen as essential for their children's sustenance and focus.

“We can’t afford much food at home. Whatever they eat at school helps a lot.” (Parent - 5)

“My daughter says they give ragi malt and egg. At least she eats something nutritious.” (Parent - 1)

Sub-theme 1.2: Ragi Malt as a Nutritious and Accepted Item

Ragi Malt was well-regarded by both parents and children for its taste and nutritional benefits. Several parents reported preparing it at home on holidays.

“They like the taste of ragi malt. We also make it with jaggery during festivals.” (Parent - 12)

“We were told in a meeting about the benefits of ragi. Now we give it at home too.” (Parent - 9)

Theme 2: Concerns Regarding Food Quality and Consistency

Sub-theme 2.1: Perceived Inconsistency in Food Preparation

Numerous parents expressed concern over inconsistent cooking quality at school - undercooked rice, watery curry, or monotonous menus.

“Sometimes the rice is too soggy, or the curry has no salt. My child takes lunch from home.” (Parent - 1)

“The food is okay most days, but when there’s brinjal curry, my child won’t eat at all.” (Parent - 3)

Sub-theme 2.2: Dislike for Specific Dishes

Brinjal curry was mentioned repeatedly as unpopular, and some parents noted that children waste food if they don’t like the day’s menu.

“She eats well when there is potato or tomato curry. But throws food when it’s brinjal.” (Parent - 6)

Theme 3: Parental Engagement and Oversight

Sub-theme 3.1: Interest in Menus and Programme Details

Many parents had a fair awareness of what food was served, often informed by their children or through school meetings. They appreciated the idea of fixed menus but wanted flexibility.

“My son shows me the timetable for food. I think they should allow some changes.” (Parent - 13)

“If there was a parent suggestion box, we would write what children like to eat.” (Parent - 8)

Sub-theme 3.2: Passive Roles in Feedback Mechanisms

While parents had concerns, few reported actively communicating them to schools due to fear of repercussions or resignation.

“Even if we say something, teachers don’t take it seriously.” (Parent - 7)

“I don’t complain. I just send food from home when needed.” (Parent - 2)

Theme 4: Trust in Institutions vs Ground-Level Experience

Sub-theme 4.1: Belief in Government Intentions

Many parents were supportive of the government's role in providing nutrition. The perception was that the state is doing its best within constraints.

“Government is thinking about poor people. We are thankful.” (Parent - 10)

“Giving food and Ragi Malt daily is a good step.” (Parent - 15)

Sub-theme 4.2: Disillusionment with Implementation

Despite trust in policy, there was some dissatisfaction with the local execution — food quality, lack of fruits, and monotonous items.

“Why not give fruits once a week? Children need vitamins too.” (Parent - 4)

“We don’t know if they follow hygiene rules while cooking.” (Parent - 11)

Theme 5: Cultural Practices and Household Dynamics

Sub-theme 5.1: Home Reinforcement of School Messages

Several parents adopted school-taught practices like using ragi or boiling eggs at home, especially when health workers or teachers explained their benefits.

“After the Anganwadi teacher told us about protein, I started boiling eggs at home.” (Parent - 14)

Sub-theme 5.2: Gendered Food Practices

In a few cases, preferences were shaped by gender roles - where girls were expected to eat less or avoid specific foods during menstruation.

“My daughter avoids school food during periods. We let her rest and give food at home.” (Parent - 16)

Theme 6: Aspirations and Suggested Improvements

Sub-theme 6.1: Menu Diversity and Nutrient Inclusion

Parents commonly suggested adding fruits, milk, or groundnut chikkis, noting that these would improve nutritional balance and acceptability.

“If they give bananas or apples once in a while, it would be good.” (Parent - 9)

“Please add pallichikki or til laddus - they are healthy and children like them.” (Parent - 1)

Sub-theme 6.2: Infrastructural and Monitoring Suggestions

Some parents recommended more hygiene checks, teacher supervision during meals, and cleanliness around the food preparation area.

“They should cover the food properly and wash hands before serving.” (Parent - 6)

“A separate place to eat would be better than sitting in classrooms.” (Parent - 13)

Telangana: ANGANWADI TEACHERS/WORKER

Theme 1: Dedication to Nutritional Service Delivery

Sub-theme 1.1: Strict Menu Adherence and Spot Feeding

AWTs showed strong commitment to daily nutrition services, diligently following the government-specified menus and ensuring food is cooked and served on-site.

“We cook rice, dal, and vegetables according to the schedule. I ensure the egg is given daily.” (AWT - 1)

“Even children from vegetarian families eat eggs after we explain the benefits.” (AWT - 10)

AWTs also checked for freshness and hygiene, often being the first to taste food before distribution.

Sub-theme 1.2: Ensuring Growth Monitoring and Supplement Use

Many AWTs actively used weighing scales, the Poshan Tracker, and physical registers to monitor growth. THR (Take-Home Rations), such as Balamrutham, were distributed monthly.

“We weigh children every month. If the weight doesn’t improve, we do counselling.” (AWT - 4)

“Sometimes mothers misuse Balamrutham. We visit and check.” (AWT - 9)

Theme 2: Community Engagement and Behavioural Change Communication

Sub-theme 2.1: Door-to-Door Rapport Building

AWTs emphasized home visits and informal discussions to educate parents about nutrition and hygiene.

“I go house to house to remind mothers to send children for meals.” (AWT - 5)

“We talk to pregnant women about diet, breastfeeding and taking medicines.” (AWT - 12)

Sub-theme 2.2: Visual and Participatory Teaching Tools

Flipbooks, millet samples, and recipe demonstrations were commonly used.

“We take the Intintiki Anganwadi book and explain with pictures. It helps them understand better.” (AWT - 7)

“We prepare millet dishes during Poshan Abhiyaan to show mothers how to cook them.” (AWT - 4)

This participatory approach fostered trust and facilitated change in food practices.

Theme 3: Navigating Cultural and Practical Barriers

Sub-theme 3.1: Dietary Taboos and Misconceptions

Cultural beliefs occasionally conflicted with AWC nutrition advice.
“Some parents say eggs are not good for girls or cause heat.” (AWT - 3)
“Mothers say Balamrutham causes loose motions or weight gain.” (AWT - 6)
AWTs countered these through repeated engagement and examples from their own children.

Sub-theme 3.2: Irregular Attendance and THR Misuse

AWTs struggled with irregular attendance from pregnant and lactating women, especially those advised bed rest.
“They say they can’t come due to leg swelling. We tell family to collect food but it's not consistent.” (AWT - 14)
“Balamrutham packets are opened and left spoiled. We educate them during visits.” (AWT - 17)

Theme 4: Coping with Administrative and Digital Challenges

Sub-theme 4.1: Digital Overload and App Failures

AWTs consistently reported difficulties with the Poshan Tracker app, especially due to poor signal, login failures, or app crashes.
“Face recognition doesn’t work. Without network, we can’t mark anyone.” (AWT - 13)
“We have to write in registers and then upload again. It’s double work.” (AWT - 11)

Sub-theme 4.2: Burden of Record Keeping

AWTs maintained multiple records - food logs, weight charts, immunization updates - with little clerical help.
“We cook, teach, weigh, clean and write records - everything.” (AWT - 8)
“If one report is missing, we get scolded. Sometimes we don’t eat lunch on time.” (AWT - 15)

Theme 5: Institutional Support and Supervision

Sub-theme 5.1: Training and Feedback

AWTs valued monthly sector meetings and refresher trainings. Many spoke positively about their supervisors and CDPOs.
“In meetings, we are told how to make millet recipes or counsel new mothers.” (AWT - 2)
“Supervisor checks teaching. If something is wrong, she corrects us politely.” (AWT - 8)

Sub-theme 5.2: Peer Learning and Mutual Encouragement

Teachers shared best practices with one another during meetings.
“One centre had a better method to store eggs. We started doing the same.” (AWT - 10)
“We motivate each other when some children are underweight.” (AWT - 16)

Theme 6: Infrastructural Gaps and Constraints

Sub-theme 6.1: Inadequate Physical Space

Several AWCs operated from rented premises, often just a single room without toilets or play areas.
“There’s no separate kitchen. We cook and feed in the same room.” (AWT - 6)
“We don’t have a shed for children to play. Rainy days are very difficult.” (AWT - 15)

Sub-theme 6.2: Delayed Rent and Material Shortage

Delayed rent payments, lack of play materials, and unreliable water supply added to the frustration.
“Landlord asks for rent every month, but we haven’t been reimbursed for five months.” (AWT - 17)
“We use our own money to buy brooms or chalk sometimes.” (AWT - 9)

Karnataka: District Agricultural Officer

Theme 1: Regional Variations in Millet Production Patterns

Sub-theme 1.1: Chikkaballapur as a Ragi-Dominant Zone

DAO - 02 described Ragi as the primary millet crop, cultivated over 45 hectares, supported by subsidies, certified seeds, and strong local demand.
“Ragi is extensively cultivated here about 45 hectares across six taluks... It is widely used throughout the region.” (DAO - 02)
This district benefits from established infrastructure and familiarity with millet-based foods, although diversification into other millets is limited.

Sub-theme 1.2: Raichur’s Sorghum and Dryland Focus

In contrast, JD - 01 noted sorghum as the dominant crop, cultivated over 1 lakh acres, with marginal presence of foxtail and pearl millet.
“We have around 1 lakh acres of sorghum cultivation... Foxtail millet covers around 2,000 hectares.” (JD - 01)
This regional difference reflects agro-ecological variations, cultural preferences, and historical dietary patterns.

Theme 2: Production Drivers and Constraints

Sub-theme 2.1: Seed Availability and Farmer Incentives

DAO - 02 highlighted certified seed shortages for non-Ragi millets as a major bottleneck, while JD - 01 noted that support had reduced to demonstration-based schemes.
“Certified seeds are in short supply, especially for millets other than Ragi.” (DAO - 02)
“We now provide support only for demonstration purposes.” (JD - 01)
Incentive-based programs like Raita Siri and Protsaha Dhana in Chikkaballapur had helped improve farmer interest.

Sub-theme 2.2: Climate Resilience and Suitability

Both officers emphasized the climate-resilient nature of millets, suitable for dryland conditions and low-input farming.
“Ragi and other millets require less water, making them ideal for drought-prone areas.” (DAO - 02)
“Sorghum and bajra are grown in dry areas with less fertile soil.” (JD - 01)
This resilience offers strategic value in regions vulnerable to erratic rainfall and soil degradation.

Theme 3: Value Addition, Processing, and Market Integration

Sub-theme 3.1: Processing as a Major Barrier

DAO - 02 identified de-husking and post-harvest processing as key obstacles limiting farmer engagement with diverse millets.
“Post-harvest processing, especially DE husking is labour-intensive... Farmers often have to travel far.” (DAO - 02)
Subsidies for processing equipment exist, but adoption remains limited due to lack of awareness or capital.

Sub-theme 3.2: Farmer Producer Organizations (FPOs) and Local Value Chains

Both officers stressed the role of FPOs in product development, packaging, and retail of Ragi malt and millet-based snacks.
“We collaborate with FPOs for value addition... Ragi is processed into powder and packaged.” (DAO - 02)
“FPOs make items like chakli, laddus, and sell them locally.” (JD - 01)
These linkages offer a path for income generation and consumer engagement, especially through events like Millet Melas and cooking competitions (Paka Spardhe).

Theme 4: Awareness and Demand-Side Strategies

Sub-theme 4.1: Nutrition Messaging and Community Events

DAO - 02 described structured outreach through Siridhanya Melas, Farmer Field Schools, and training through ATMA, emphasizing millet health benefits and cooking ideas.
“We organized a Siridhanya Mela... and awareness sessions through ATMA.” (DAO - 02)
JD - 01 noted that in Raichur, demand-generation was less urgent for sorghum, which remains a staple, but may be needed for Ragi and other “urban” millets.
“If we want to introduce Ragi, we would need more awareness efforts.” (JD - 01)

Sub-theme 4.2: School and Anganwadi Integration as Untapped Potential

DAO - 02 suggested that institutions like Anganwadis could be leveraged for promotion but were not currently active partners.
“They don’t organize awareness programs... But if we approach them, I believe they would support such efforts.” (DAO - 02)
JD - 01 deferred this domain to Women and Child Development, highlighting limited inter-departmental convergence.

Theme 5: Intersectoral Collaboration and Policy Integration

Sub-theme 5.1: Gaps in Cross-Departmental Synergy

Both respondents pointed to a lack of coordination with health and education departments, despite the growing policy emphasis on millet mainstreaming.
“Currently, there isn't much synergy... Our focus is mainly on production.” (JD - 01)
DAO - 02 acknowledged the need to align agriculture with nutrition messaging in schools and Anganwadis.

Sub-theme 5.2: B2B Platforms and Private Sector Interest

DAO - 02 described events like International Trade Fairs as opportunities to build B2B linkages, encouraging entrepreneurship in millet value chains.
“We’ve held cooking competitions... and connected processors and suppliers.” (DAO - 02)
JD - 01 also expressed openness to public-private partnerships, contingent on alignment with government schemes.
“If private entities want to collaborate, we’ll support them.” (JD - 01)

Theme 6: Barriers to Scaling Cultivation and Consumption

Sub-theme 6.1: Land Constraints and Farmer Reluctance

DAO - 02 noted that Ragi already occupies 40–45% of agricultural area in Chikkaballapur, limiting diversification into other millets.
“The primary challenge is the limited land available for cultivating millets other than Ragi.” (DAO - 02)
JD - 01 added that economic factors and soil conditions determine farmer preferences for paddy vs. millet.

Sub-theme 6.2: Consumption Gaps Driven by Taste, Habit, and Cost

Taste barriers were noted for non-sorghum millets, while processing costs increased market prices, limiting urban consumption.
“Apart from Ragi, other millets tend to be expensive due to higher processing charges.” (DAO - 02)
“Taste can be influenced by the additional ingredients used in food preparations.” (JD - 01)

Karnataka: Supervisor

Theme 1: Hands-On Monitoring and Field Accountability

Sub-theme 1.1: Daily Visits as a Core Practice

Supervisors reported visiting 2–3 centers daily for real-time assessments, checking attendance, food quality, hygiene, and preschool activities.

“Every day, I make surprise visits to at least two AWCs. If any issue arises, I escalate it immediately.” (Supervisor - 09)
“We check the weight register, food menu, and ask children about the meal taste.” (Supervisor - 12)
These visits served not just for control but also for relationship-building with staff and beneficiaries.

Sub-theme 1.2: Real-Time Data Entry Challenges

Despite app-based tracking (e.g., Poshan Tracker), Supervisors and AWWs face challenges with network issues, app glitches, and dual reporting.
“Face capture doesn't work properly in villages with poor signal. Teachers get frustrated.” (Supervisor - 15)
“Even after updating the app, we have to keep written records for safety.” (Supervisor - 18)

Theme 2: Food Supply and Quality Issues

Sub-theme 2.1: Inconsistent Supply Chains and Egg Complaints

Many Supervisors reported delays in egg delivery, underweight eggs, or lack of follow-through from contractors.
“We return eggs that weigh less than 45g. But those delays feeding and angers parents.” (Supervisor - 10)
“Sometimes we get fewer eggs than required. We try to adjust by rotation.” (Supervisor - 16)

Sub-theme 2.2: Hygiene and Cleanliness Concerns

Supervisors highlighted concerns over unclean utensils, storage issues, and lack of proper handwashing spaces, particularly in older centers.
“Some AWCs don’t have clean water for handwashing. We’ve raised this in our reports.” (Supervisor - 19)

Theme 3: Beneficiary Behavior and Compliance Gaps

Sub-theme 3.1: Resistance to Spot Feeding Among Mothers

Pregnant and lactating women often resist coming to centers for hot cooked meals, citing distance, childcare burden, or lack of privacy.
“They say it’s easier to take dry ration. Some are shy to eat in public.” (Supervisor - 14)
“We counsel them, but many still ask for take-home food.” (Supervisor - 17)

Sub-theme 3.2: Seasonal and Cultural Barriers to Egg Consumption

Supervisors reported drop in egg consumption during religious festivals or due to community-specific beliefs.
“During Shravan, egg refusal increases. We let them take it home.” (Supervisor - 11)

Theme 4: Supporting and Mentoring Anganwadi Workers

Sub-theme 4.1: App Usage and Documentation Support

Supervisors spent significant time helping AWWs enter data, sync reports, and understand new curriculum or tracker updates.
“We even go to their homes at night to help with app entry. Otherwise, it stays pending.” (Supervisor - 09)

Sub-theme 4.2: Motivational Challenges and Burnout

Some Supervisors noted that AWWs, especially in overburdened centers, felt demoralized due to low recognition and multitasking stress.
“They cook, teach, clean, and now manage smartphones too. They feel invisible.” (Supervisor - 20)
Supervisors played a dual role: compliance enforcers and emotional anchors.

Theme 5: Record Verification and Data Integrity

Sub-theme 5.1: Cross-Verification of Digital and Manual Records

Supervisors used physical registers, random checks, and in-person interviews with beneficiaries to ensure accuracy.
“We pick two names from the list and check whether the child actually attended and ate.” (Supervisor - 13)

Sub-theme 5.2: Concerns About False Reporting or Over-Compliance

In some cases, Supervisors suspected inflated entries or “ghost beneficiaries” to meet reporting requirements.
“Some AWWs feel pressure to show 100% feeding. We try to cross-check through parents.” (Supervisor - 16)

Theme 6: Community Dynamics and Parent Relationships

Sub-theme 6.1: Strengthening Community Trust

Supervisors emphasized the importance of explaining nutrition benefits to parents and organizing events like Poshan Maah for visibility.
“We invite parents, show them how Ragi Malt is made, and let them taste it.” (Supervisor - 12)

Sub-theme 6.2: Handling Complaints and Expectations

Supervisors dealt with complaints about egg size, menu boredom, or food quality, often without sufficient leverage to make systemic changes.
“Parents want fruits or chikkis. We explain budget constraints.” (Supervisor - 19)

Theme 7: Suggestions for Improvement

Sub-theme 7.1: Menu Expansion and Nutritive Additions

Supervisors recommended adding fruits, milk, or iron-rich snacks to increase nutrient diversity and reduce monotony.
“Dry fruit laddus or banana once a week will help iron and energy levels.” (Supervisor - 11)

Sub-theme 7.2: Training and Infrastructure Enhancement

They called for refresher trainings for AWWs, better kitchen spaces, and provision of handwashing stations.
“We need more realistic training modules, not just PowerPoints.” (Supervisor - 17)
“Some AWCs don’t even have water filters or clean storage.” (Supervisor - 10)

Karnataka: Child Development Program Officer

Introduction

Child Development Project Officers (CDPOs) are central to the administration of Integrated Child Development Services (ICDS), bridging policy, program implementation, and frontline service delivery. Their perspectives illuminate systemic enablers and constraints affecting nutritional programming, including Ragi Malt, Take-Home Ration (THR), and supplementary feeding. This analysis synthesizes reflections from CDPOs across Chikkaballapur and Raichur to better understand the on-ground realities of delivering child and maternal nutrition services in Karnataka.

Theme 1: Managing Multi-Dimensional Program Complexity

Sub-theme 1.1: Balancing Administrative and Field Duties

CDPOs described a workload divided between office-based data compliance and field-level crisis management.
“My day starts with reviewing reports and ends with visiting centers where complaints have been made.” (CDPO - 06)
“We juggle between monitoring, app syncing, and solving interpersonal issues among staff.” (CDPO - 09)

Sub-theme 1.2: Limited Programmatic Flexibility

Despite being district-level managers, CDPOs often felt constrained by rigid guidelines, particularly related to menu design and procurement.
“We have no say in what is being served. Even if brinjal curry is rejected by all, we can’t change it.” (CDPO - 11)

Theme 2: Food Supply and Quality Challenges

Sub-theme 2.1: Irregularities in Stock and Supply Chains

CDPOs cited delays and inconsistencies in egg delivery, THR distribution, and dry ration supplies, often exacerbated by vendor non-compliance.
“The quality of eggs is sometimes poor, underweight or broken. Yet, there’s no alternate vendor system.” (CDPO - 04)
“Balamrutham stocks are delayed. In some centers, it’s out of stock for weeks.” (CDPO - 07)

Sub-theme 2.2: Monitoring Without Enforcement Power

While CDPOs oversee daily nutrition services, they reported limited authority to penalize or replace defaulting suppliers.
“We can only send reminders or complaints to higher-ups. Action takes time, and meanwhile, children suffer.” (CDPO - 08)

Theme 3: Cultural Realities and Beneficiary Behavior

Sub-theme 3.1: Resistance to Spot Feeding

CDPOs noted that pregnant and lactating women often resisted spot feeding due to logistical issues, stigma, or family control.
“Women say they can’t walk 1–2 km to the center or are not allowed by in-laws.” (CDPO - 10)
“They ask: why should I eat in public? They prefer dry ration.” (CDPO - 05)

Sub-theme 3.2: Religious and Seasonal Taboos

Egg refusal was common during religious observances or due to caste norms, impacting protein supplementation targets.
“During Shravan and fasting days, egg consumption drops drastically.” (CDPO - 04)

Theme 4: Frontline Support and Supervision Dynamics

Sub-theme 4.1: Emotional Labor and Burnout Among AWTs

CDPOs were acutely aware of the multitasking burden on Anganwadi Workers (AWWs), teaching, cooking, cleaning, reporting.
“They do everything—cook food, teach kids, fill registers, and handle irate parents. Many are demotivated.” (CDPO - 06)

Sub-theme 4.2: Capacity Gaps in Digital and Nutrition Literacy

While digital apps are mandatory (e.g., Poshan Tracker), CDPOs noted gaps in training and comfort with mobile systems.
“Many AWWs struggle with the app, sync errors, login issues, or data duplication frustrate them.” (CDPO - 09)

Theme 5: Data, Documentation, and Accountability Pressures

Sub-theme 5.1: App Burden vs. Field Realities

CDPOs highlighted the tension between real-time digital reporting expectations and unreliable rural internet access.
“We are told to ensure real-time data, but in many areas, there’s no signal.” (CDPO - 08)

They also reported that manual records continue as backup, doubling the workload.
Sub-theme 5.2: Verification and Trust Issues
To ensure data accuracy, CDPOs relied on phone calls, random checks, and surprise visits.
“We call beneficiaries to ask if they received Balamrutham or if the food was served. That’s the only way to know.” (CDPO - 11)

Theme 6: Community Expectations and Strategic Engagement

Sub-theme 6.1: Rising Awareness but Poor Program Customization

CDPOs observed that community awareness about nutrition is growing, especially around Ragi Malt and eggs, but expectations are rising too.
“Parents now ask for fruits, chikkis, milk. But the program hasn’t evolved to meet those demands.” (CDPO - 07)

Sub-theme 6.2: Grassroots Innovations and Local Adjustments

Despite constraints, some CDPOs promoted local recipes, taste demonstrations, or partner engagement (e.g., NGOs, CSR) to improve compliance.
“We organized millet laddus and showed mothers how to prepare them. That helped build trust.” (CDPO - 05)

Theme 7: Aspirations for Systemic Reform

Sub-theme 7.1: Policy Flexibility and Budget Autonomy

CDPOs recommended decentralization of menu planning, procurement, and training modules to suit local preferences and realities.
“Give us district-level autonomy to tweak the menu. What works in one district fails in another.” (CDPO - 10)

Sub-theme 7.2: Structural Improvements and Recognition

They advocated for investment in kitchen infrastructure, AWC repair, regular staff upskilling, and non-monetary recognition for field staff.
“AWWs feel invisible. Even a certificate for good work can motivate them.” (CDPO - 06)

Karnataka: School-In-Charges

Introduction

School In-Charges (SICs) play a pivotal role in coordinating and monitoring school-based nutrition programs like the Mid-Day Meal (MDM) and Ragi Malt provision. Their insights are key to understanding the practical challenges, institutional dynamics, and innovations that impact food service quality and student outcomes. This thematic analysis explores the lived experiences and managerial reflections of SICs in rural Karnataka.

Theme 1: Administrative Ownership and Daily Oversight

Sub-theme 1.1: Commitment to Monitoring and Quality Assurance

SICs expressed strong ownership of nutrition delivery. They were involved in daily oversight of food preparation, distribution, and record keeping.
“Every day, I personally check the food quality and ask students about the taste.” (SIC - 20)
“We ensure that rice is cooked properly and curry is not too watery or spicy.” (SIC - 29)
This hands-on engagement was motivated by care for students and institutional accountability.

Sub-theme 1.2: Accurate Record Maintenance Amid Digital-Manual Overlap

Despite digitization, many SICs maintained physical registers along with app entries due to network failures and reporting demands.
“Sometimes the Poshan Tracker doesn’t open, so we keep everything written too.” (SIC - 26)
“There is too much duplication – attendance, Ragi, food logs, all go in separate books.” (SIC - 33)

Theme 2: Menu Preferences and Student Responses

Sub-theme 2.1: Widespread Dislike of Certain Items

Brinjal curry was consistently cited as highly disliked by students, leading to wastage or avoidance.
“Children throw food when it’s brinjal curry day. They prefer potato or tomato.” (SIC - 22)
“Even we know they won’t eat it. Still, it’s in the menu.” (SIC - 18)
This misalignment between menu design and student taste reduced meal efficacy.

Sub-theme 2.2: High Acceptance of Ragi Malt

Ragi Malt was consistently praised for taste, energy value, and satiety. Several SICs reported zero refusals for Ragi.
“Students like Ragi Malt more than tea. It helps them focus in class.” (SIC - 25)
“Earlier they used to skip breakfast. Now Ragi fills them up.” (SIC - 32)
Many SICs encouraged staff to ensure consistency in taste and portion size.

Theme 3: Community Interactions and Parent Perceptions

Sub-theme 3.1: Mixed Feedback from Parents

While most parents were supportive, some expressed dissatisfaction over menu monotony or food quality.
“Parents tell us their children won’t eat brinjal curry and ask for a change.” (SIC - 27)
“During PTMs, some request for fruits or boiled eggs.” (SIC - 30)

Sub-theme 3.2: Efforts to Build Trust and Food Literacy

SICs used PTMs and informal discussions to explain nutrition benefits and build community trust.
“We show them the rice, eggs, and explain the importance of Ragi Malt.” (SIC - 21)
Several schools organized nutrition days or taste sessions for parents.

Theme 4: Resource Constraints and Operational Challenges

Sub-theme 4.1: Irregular Supply Chains and Stock Gaps

Eggs and provisions were occasionally delayed, underweight, or insufficient.
“Sometimes we get broken eggs or fewer than required. Children ask for more.” (SIC - 31)
“There are days we cook with leftover dal due to rice shortage.” (SIC - 19)

Sub-theme 4.2: Infrastructure Deficits and Space Constraints

Many schools lacked dedicated kitchens, storage, or clean dining areas.
“There is no kitchen. We cook in the corridor using a gas stove.” (SIC - 23)
“Students eat under the tree. It’s difficult during monsoon.” (SIC - 28)

Theme 5: Waste Minimization and Adaptive Practices

Sub-theme 5.1: Portion Management and Student Counseling

SICs monitored serving sizes and guided students to take what they can eat to minimize waste.
“We tell them to take small servings first. If they like it, they can ask for more.” (SIC - 24)
They also addressed food waste with behavioral messaging during assemblies.

Sub-theme 5.2: Adjustments Based on Real-Time Feedback

Some SICs allowed cooks to modify dishes slightly for better taste without violating the core menu.
“If children dislike brinjal, we add potato to make it more palatable.” (SIC - 33)

Theme 6: Aspirations for Improvement

Sub-theme 6.1: Inclusion of Fruits and Iron-Rich Snacks
SICs advocated for the addition of bananas, seasonal fruits, peanut chikkis, or dry fruits.
“One fruit per week will make children happy and improve nutrition.” (SIC - 26)
“Jaggery-based chikki can help with iron deficiency.” (SIC - 18)

Sub-theme 6.2: Enhanced Training and Staff Support
There was a call for regular training of cooks, clear SOPs, and acknowledgment of teacher efforts in food supervision.
“We are teachers but spend hours on food duty. Recognition or incentives would help.” (SIC - 20)
“Cooks need refresher training on hygiene and nutrition.” (SIC - 29)
Karnataka: Children

Karnataka: Children

Theme 1: Daily Nutrition as a Pillar of School Life

Sub-theme 1.1: Dependence on School Meals for Energy and Focus
Students consistently acknowledged the importance of school food in sustaining energy and enabling concentration during lessons.
“When we drink Ragi Malt, we don’t feel sleepy or hungry until lunch.” (Student - 20)
“I like the food in school. We can study better when the stomach is full.” (Student - 23)
In contexts where home food was limited or skipped, school meals were essential.

Sub-theme 1.2: Appreciation of Ragi Malt and Mid-Day Meals
Ragi Malt emerged as a particularly valued item, often associated with energy, satiety, and enjoyment.
“Ragi Malt is my favorite. It tastes good, and I feel fresh after drinking it.” (Student - 31)
“Sometimes we drink it at home too my mother learned to make it from school.” (Student - 25)
The Mid-Day Meal was appreciated for its consistency and variety, despite some limitations.

Theme 2: Food Preferences and Menu Acceptance

Sub-theme 2.1: Likes and Dislikes Centered Around Curry Types
Students expressed strong preferences for certain curries and aversions to others, particularly brinjal, which was frequently criticized.
“Nobody eats brinjal curry. We try to eat rice only on that day.” (Student - 19)
“We all love potato curry and tomato dal. Brinjal should be removed.” (Student - 36)
These preferences affected consumption, with disliked items often wasted.

Sub-theme 2.2: Limited Influence on Menu Changes
While students shared feedback with teachers, many felt their suggestions were not acted upon.
“We told the teacher we don’t like brinjal, but it’s still coming every week.” (Student - 24)
“They ask for our opinions but don’t change the food.” (Student - 28)
This highlights a disconnect between participatory efforts and policy flexibility.

Theme 3: Institutional Monitoring and Teacher Roles

Sub-theme 3.1: Supervision Ensures Fairness and Cleanliness
Students widely acknowledged that teachers and ayahs monitored food distribution to ensure equal portions and minimize waste.
“Our teacher makes sure everyone gets the same amount.” (Student - 21)
“They check that no one throws food. If we don’t like it, we are told to take less.” (Student - 35)
Supervision reinforced a sense of order and respect around meals.

Sub-theme 3.2: Ayahs as Friendly Providers
Ayahs were generally respected and seen as caring providers, though some students expressed fear or reluctance to voice preferences.
“Ayah aunty is nice but won’t change the curry if we don’t like it.” (Student - 27)

Theme 4: Food Waste and Adaptive Strategies

Sub-theme 4.1: Wastage Driven by Dislike and Over-Serving
Students admitted that food, especially curry, was sometimes wasted due to portion size or dislike.
“If they give too much and we don’t like it, we throw it behind the class.” (Student - 22)
Others adapted by taking smaller servings or sharing with peers.
“I ask for less if it’s brinjal. That way I don’t waste.” (Student - 30)

Sub-theme 4.2: Emotional Discomfort Around Waste
Some students expressed guilt or discomfort over food waste, especially when reminded of poor children elsewhere.
“Teacher tells us not to waste. She says many kids are hungry in other places.” (Student - 33)

Theme 5: Parental Involvement and Home Continuity

Sub-theme 5.1: Parental Encouragement to Eat School Food
Most students reported that parents encouraged them to eat at school, appreciating the government’s efforts.
“My mother tells me to eat well in school and not skip food.” (Student - 29)

Sub-theme 5.2: Replication of Ragi Malt at Home
Several students shared that Ragi Malt recipes were replicated at home, reflecting program spillover into domestic practices.
“We make Ragi Java at home now. My sister likes it too.” (Student - 34)
This indicates a positive feedback loop between institutional and household nutrition.

Theme 6: Suggestions and Aspirations

Sub-theme 6.1: Requests for Fruits and Nutrient Diversity
Students requested the addition of fruits, milk, or sweets like jaggery chikki to enhance taste and nutrition.
“One banana or an apple a week would be nice.” (Student - 26)
“Chikki with peanuts and jaggery gives energy.” (Student - 20)

Sub-theme 6.2: Menu Flexibility and Feedback Systems
Students aspired for menus tailored to local tastes and for their feedback to be heard more actively.
“Why not let each school choose one item in the menu?” (Student - 36)
Some also asked for cleaner serving spaces and better handwashing facilities, linking hygiene with dignity.

Karnataka: Parents

Theme 1: School Meals as a Lifeline for Child Nutrition

Sub-theme 1.1: Ensuring One Nutritious Meal a Day
Parents from low-income backgrounds expressed that school meals often serve as the only assured source of nutrition for their children.
“We work in fields and can’t always cook in the morning. At least they get something filling at school.” (Parent - 18)
“Sometimes, our own meals are uncertain. But school food is regular.” (Parent - 21)

Sub-theme 1.2: Positive Changes in Health and Habits

Many parents reported that after the introduction of regular MDM and Ragi Malt, children's appetite, immunity, and school attentiveness improved.
"My daughter used to be very weak. Now she eats more and falls ill less often." (Parent - 24)
"She enjoys coming to school because of the food too." (Parent - 30)

Theme 2: Acceptance and Resistance to School Menu Components

Sub-theme 2.1: Wide Acceptance of Ragi Malt
Ragi Malt was largely seen as nutritious, filling, and palatable, with some parents preparing it at home after learning from school staff.
"It keeps them full until lunch. We also prepare it at home during summer." (Parent - 25)
"Children like the taste. Even my younger son drinks it before school." (Parent - 19)

Sub-theme 2.2: Dislike and Waste Associated with Certain Items
Brinjal curry was consistently cited as a disliked dish, leading to partial or complete meal rejection.
"When they serve brinjal, my son skips the curry and eats only rice." (Parent - 17)
"Why not give potato or tomato more often? Kids waste brinjal." (Parent - 27)

Theme 3: Role of Teachers and Institutional Monitoring

Sub-theme 3.1: Teacher Oversight as Assurance
Parents expressed trust in teachers and helpers who supervised meals, ensuring order, portion control, and reduced waste.
"Teachers watch children while eating and make sure no one throws food." (Parent - 28)
"They even remind students to wash hands before eating." (Parent - 23)

Sub-theme 3.2: Discomfort in Voicing Concerns
While teachers were seen as well-intentioned, parents noted that some ayahs did not respond to feedback, or fear of hierarchy prevented complaint.
"We don't say anything unless there's a big issue. Don't want our child to get scolded." (Parent - 32)
"Ayah aunty is strict; children don't tell her even if they don't like the food." (Parent - 20)

Theme 4: Parental Engagement and Feedback Gaps

Sub-theme 4.1: Limited Influence on Menu or Service
Parents shared suggestions during Parent-Teacher Meetings (PTMs), but felt their input rarely resulted in visible changes.
"We requested fruit once a week, but it never happened." (Parent - 22)
"They ask our opinion but don't follow it." (Parent - 26)

Sub-theme 4.2: Desire for Structured Feedback and Involvement
There was a clear aspiration for more formal channels to participate in menu planning or food quality oversight.
"Why can't they have a parents' food committee?" (Parent - 31)
"We can taste food sometimes and give suggestions if they allow." (Parent - 30)

Theme 5: Cultural Beliefs and Household Dynamics

Sub-theme 5.1: Seasonal and Religious Taboos
Some families reported avoiding eggs or Ragi Malt during festivals or due to beliefs about their effects.
"During Shravan, we don't eat eggs. We ask the child to bring it home or skip." (Parent - 29)
"Few say Ragi causes cold, but we never had that issue." (Parent - 18)

Sub-theme 5.2: Home Replication of Healthy Practices

Positive behaviors like Ragi consumption and boiled egg preparation were increasingly replicated at home.
“Now we give eggs thrice a week. Earlier it was only once.” (Parent - 25)
“I didn’t know Ragi was good until the teacher explained during Nutrition Day.” (Parent - 17)

Theme 6: Aspirations for Enhanced Nutrition Delivery

Sub-theme 6.1: Calls for Nutritional Diversity and Additions
Parents desired more variety, especially fruits, milk, and iron-rich snacks like jaggery laddus or peanut chikki.
“Give bananas or oranges once a week. They don’t get fruits otherwise.” (Parent - 20)
“Chikki is both tasty and healthy. Kids love it.” (Parent - 28)

Sub-theme 6.2: Infrastructure and Operational Concerns
There were concerns about the lack of clean utensils, unhygienic serving conditions, and irregular supply of eggs or THR.
“Sometimes, children eat sitting on the floor near drains.” (Parent - 31)
“Eggs are not always fresh. There should be quality checks.” (Parent - 22)

Karnataka: Anganwadi Worker / Anganwadi Teacher

Theme 1: Dedicated Execution of Nutritional Services

Sub-theme 1.1: Responsibility Beyond the Mandate
AWTs described their deep ownership of nutrition delivery. Despite resource constraints, they consistently ensured children received meals and eggs on time.
“Even if eggs arrive late, we get them from nearby centers or shops. We can’t let children go hungry.” (AWT - 18)
“I boil eggs early and check for cracks. If one is bad, I don’t give it.” (AWT - 24)
Teachers also absorbed costs for minor deficits, showcasing emotional investment in their roles.

Sub-theme 1.2: Vigilance in Food Quality and Safety
AWTs showed careful attention to food preparation, hygiene, and child preferences.
“If the dal is too watery or curry too spicy, we cook again.” (AWT - 20)
“Children like tomato curry, but they dislike brinjal. So we give alternatives.” (AWT - 26)

Theme 2: Engaging Families and Cultural Realities

Sub-theme 2.1: Navigating Dietary Taboos and Beliefs
Teachers had to negotiate with families on food taboos, including egg refusal during religious months or misconceptions about ragi.
“During festivals, they don’t want to eat eggs. We pack and give them for home.” (AWT - 22)
“Some say ragi is a ‘cool’ food and causes cold. We explain its health benefits.” (AWT - 30)

Sub-theme 2.2: Struggles with Beneficiary Compliance
AWTs faced resistance from pregnant and lactating women in attending spot feeding, especially when the center was distant or the mother was recovering post-delivery.
“Mothers say they can’t walk far, especially with newborns. They ask for raw rations.” (AWT - 28)
“Some mothers want to send others to collect THR. But we insist on face recognition now.” (AWT - 21)

Theme 3: Record Management and Digital Burdens

Sub-theme 3.1: App Glitches and Redundant Effort
Teachers expressed frustration with Poshan Tracker and NHTS apps, including login failures, syncing delays, and face recognition errors.
“The app asks for face capture. Sometimes it doesn’t recognize the child. We keep trying.” (AWT - 32)
“We have to enter the same data twice—once in books, once in the app.” (AWT - 25)

Sub-theme 3.2: Paper-Digital Duplication

Despite digitization efforts, AWTs were instructed to maintain parallel physical registers due to frequent technical failures.

"Even if we update the app, supervisors ask for the written register." (AWT - 19)

Theme 4: Resource and Infrastructure Constraints

Sub-theme 4.1: Inconsistent Supply Chain

AWTs reported delays in egg and THR supply, sometimes receiving underweight eggs or reduced quantities without prior notice.

"Eggs are sometimes small or broken. If we complain, suppliers delay the next delivery." (AWT - 27)

Sub-theme 4.2: Inadequate Infrastructure and Lack of Helpers

Many AWTs operated without helpers (ayahs) and from cramped or rented facilities without kitchens or proper storage.

"I cook, teach, and clean, all in one room. No separate helper." (AWT - 23)

"We keep Balamrutham packets on a plastic sheet. There is no cupboard or shelf." (AWT - 33)

Theme 5: Community Nutrition Education and Adaptation

Sub-theme 5.1: Demonstrating Recipes and Explaining Benefits

Teachers engaged in demonstrations of millet and Balamrutham-based dishes, especially during community events and nutrition campaigns.

"During Poshan Maah, I made Ragi laddus and gave samples to mothers." (AWT - 29)

"We show how to make Balamrutham into porridge or halwa." (AWT - 20)

Sub-theme 5.2: Child-Centered Nutrition Teaching

AWTs integrated food into preschool education — using food items to teach counting, colors, or healthy habits.

"We count eggs, name vegetables. Children learn while eating." (AWT - 31)

Theme 6: Aspirations and System-Level Recommendations

Sub-theme 6.1: Menu Variety and Nutritional Enhancement

Teachers advocated for the inclusion of fruits, dry fruits, jaggery sweets, or local chikkis to address food fatigue and improve nutrition.

"One banana a week or chikki would make children happy and healthy." (AWT - 30)

"Dry fruit laddus or Ragi malt with jaggery can be introduced." (AWT - 26)

Sub-theme 6.2: Recognition, Training, and Support

AWTs requested refresher training, especially on app usage and updated preschool curricula, and called for formal acknowledgment of their work.

"We haven't received training in over a year. Apps keep changing, and we are not told clearly." (AWT - 24)

"We work long hours, even at home. But no one appreciates us." (AWT - 33)

Results for the in-depth interviews

Table 7. Distribution of sociodemographic and millet consumption practices across Telangana and Karnataka

Variables	-	Telangana (n= 272)	Karnataka (n= 240)
Age, mean (SD)	-	38.73 (12.79)	41.68 (11.37)
Gender, n (%)	Female	263 (96.7)	226 (94.2)
	Male	9 (3.3)	14 (5.8)
Household members, n (%)	One	8 (2.9)	3 (1.2)
	Two	19 (7.0)	19 (7.9)
	Three	39 (14.3)	34 (14.2)
	Four	71 (26.1)	69 (28.8)
	Five	74 (27.2)	51 (21.2)
	Six	35 (12.9)	24 (10.0)
	Seven	11 (4.0)	14 (5.8)
	Eight	9 (3.3)	10 (4.2)
	Nine	1 (0.4)	8 (3.3)
	Ten or more	5 (1.8)	8 (3.3)
Millet Consumption, n (%)	No	25 (9.2)	0 (0.0)
	Yes	247 (90.8)	240 (100.0)
Millet Consumption Frequency, n (%)	Daily	227 (83.5)	240 (100.0)
	Alternate Days	5 (1.8)	0 (0.0)
	Twice Weekly	6 (2.2)	0 (0.0)
	Occasional / Seasonal	8 (2.9)	0 (0.0)
	Never	26 (9.6)	0 (0.0)
Jowar, n (%)	No	36 (13.2)	105 (43.8)
	Yes	236 (86.8)	135 (56.2)
Jowar Consumption Frequency, n (%)	Daily	188 (69.1)	123 (51.2)
	Alternate Days	8 (2.9)	0 (0.0)
	Twice Weekly	28 (10.3)	1 (0.4)
	Occasional / Seasonal	12 (4.4)	12 (5.0)
	Never	36 (13.2)	104 (43.3)
Finger Millet Consumption, n (%)	No	47 (17.3)	76 (31.7)
	Yes	225 (82.7)	164 (68.3)
Finger Millet Consumption Frequency, n (%)	Daily	147 (54.0)	122 (50.8)
	Alternate Days	14 (5.2)	0 (0.0)
	Twice Weekly	31 (11.4)	6 (2.5)
	Occasional / Seasonal	33 (12.1)	36 (15.0)
	Never	47 (17.3)	76 (31.7)

Bajra Millet Consumption, n(%)	No	194 (71.3)	136 (56.7)
	Yes	78 (28.7)	104 (43.3)
Bajra Consumption Frequency, n(%)	Daily	12 (4.4)	91 (38.0)
	Alternate Days	5 (1.8)	0 (0.0)
	Twice Weekly	28 (10.3)	8 (3.3)
	Occasional / Seasonal	33 (12.1)	5 (2.1)
	Never	194 (71.3)	136 (56.7)
Little Millet consumption, n(%)	No	254 (93.4)	230 (95.8)
	Yes	18 (6.6)	10 (4.2)
Little Millet Consumption Frequency, n(%)	Daily	1 (0.4)	2 (0.8)
	Alternate Days	2 (0.7)	0 (0.0)
	Twice Weekly	7 (2.6)	4 (1.7)
	Occasional / Seasonal	8 (2.9)	4 (1.7)
	Never	254 (93.4)	230 (95.8)
Foxtail Millet Consumption, n (%)	No	233 (85.7)	216 (90.0)
	Yes	39 (14.3)	24 (10.0)
Foxtail Millet Consumption Frequency, n (%)	Daily	3 (1.1)	1 (0.4)
	Alternate Days	4 (1.5)	0 (0.0)
	Twice Weekly	18 (6.6)	7 (2.9)
	Occasional / Seasonal	14 (5.1)	16 (6.7)
	Never	233 (85.7)	216 (90.0)
Kodo Millet Consumption, n (%)	No	263 (96.7)	236 (98.3)
	Yes	9 (3.3)	4 (1.7)
Kodo Millet Consumption Frequency, n (%)	Daily	0 (0.0)	1 (0.4)
	Alternate Days	1 (0.4)	0 (0.0)
	Twice Weekly	5 (1.8)	2 (0.8)
	Occasional / Seasonal	3 (1.1)	1 (0.4)
	Never	263 (96.7)	236 (98.3)
Proso Millet Consumption, n (%)	No	266 (97.8)	237 (98.8)
	Yes	6 (2.2)	3 (1.2)

Proso Millet Consumption Frequency, n (%)	Daily	0 (0.0)	0 (0.0)
	Alternate Days	1 (0.4)	0 (0.0)
	Twice Weekly	2 (0.7)	2 (0.4)
	Occasional / Seasonal	3 (1.1)	1 (0.4)
	Never	266 (97.8)	237 (98.8)
Barnyard Millet Consumption, n (%)	No	266 (97.8)	237 (98.8)
	Yes	6 (2.2)	3 (1.2)
Barnyard Millet Consumption Frequency, n (%)	Daily	0 (0.0)	
	Alternate Days	2 (0.7)	
	Twice Weekly	3 (1.1)	1 (0.4)
	Occasional / Seasonal	1 (0.4)	2 (0.8)
	Never	266 (97.8)	237 (98.8)
Millete Count, median (IQR)	-	2 (2, 3)	2 (1, 2)
Source of Millet, n (%)	Market Purchase	208 ()	97 (40.4)
	Own Production	39 ()	143 (59.6)
	No consumption	25 (9.2)	-
Reasons for not consuming Millets more frequently, n (%)	Consuming Regularly	46 (16.9)	183 (76.2)
	Cost issues	15 (5.5)	0 (0.0)
	Not available	50 (18.4)	46 (19.2)
	Not Aware	152 (55.9)	11 (4.6)
	Recently got aware	9 (3.3)	0 (0.0)
Awareness about the nutritional benefits of Millets, n (%)	No	14 (5.1)	90 (37.5)
	Yes	258 (94.9)	150 (62.5)
Measures to Promote Household usage of millets, n (%)	Easy availability in market	39 (14.3)	143 (59.6)
	Reduced cost	104 (38.2)	16 (6.7)
	Promote awareness	41 (15.1)	30 (12.5)
	Availability in Ration shops	48 (17.7)	46 (19.2)
	No idea	40 (14.7)	5 (2.1)
Suggestions to Promote Community usage of millets, n (%)	Reduced Price	47 (17.3)	16 (6.7)
	More Availability	33 (12.2)	123 (51.2)
	Promote awareness	15 (5.5)	30 (12.5)
	More Farming	6 (2.2)	5 (2.1)
	Availability in Ration shop	131 (48.2)	61 (25.4)
	No suggestion	40 (14.7)	5 (2.1)

The comparison between Telangana and Karnataka highlights distinct patterns in millet consumption and awareness among households in the two states. Respondents in Karnataka were slightly older on average than those in Telangana, but in both states, the overwhelming majority of respondents were female. Household sizes were largely similar, with most families consisting of four to five members, though larger households were marginally more common in Karnataka.

Millet consumption was nearly universal in Karnataka, with every surveyed respondent reporting daily consumption. In contrast, while 91% of respondents in Telangana reported consuming millets, a small proportion admitted to rare or no consumption. Even among millet consumers in Telangana, a few consumed millets only occasionally or a few times a week, unlike in Karnataka where all respondents consumed them daily.

In terms of specific millets, jowar (sorghum) and finger millet (ragi) were the most commonly consumed in both states, though their popularity varied. Jowar had higher uptake in Telangana, with 87% of respondents consuming it, compared to 56% in Karnataka. Daily jowar consumption was also more common in

Telangana. Finger millet was widely consumed in both states, though it was slightly more prevalent in Telangana (83%) than Karnataka (68%), and daily usage rates were comparable across both states.

Bajra (pearl millet), on the other hand, was much more commonly consumed in Karnataka, with 43% of respondents reporting consumption and 38% using it daily. In Telangana, only 29% consumed bajra, and daily usage was limited to just 4%. Other millets like little millet, foxtail millet, kodo, proso, and barnyard millet were rarely consumed in either state, and when used, they were generally limited to occasional or seasonal consumption.

The number of different millets consumed per household was similar between the two states, with a median of two. However, Telangana households showed slightly greater diversity in millet consumption compared to those in Karnataka. The source of millets also differed notably. In Telangana, most people relied on market purchases for millet consumption, while in Karnataka, a significant proportion grew their own millets. This difference in sourcing likely reflects varying levels of agricultural engagement and access to millet farming.

Barriers to millet consumption varied significantly between the states. In Telangana, a major barrier was lack of awareness, with over half of the respondents citing it as a reason for not consuming millets more frequently. Other concerns included unavailability and cost. In Karnataka, such barriers were almost absent, as most respondents reported already consuming millets regularly.

Awareness about the nutritional benefits of millets was surprisingly higher in Telangana, where 95% of respondents were aware, compared to only 63% in Karnataka. Some of the benefits enumerated by respondents included that millets are anti-hypertensive, anti-diabetic, rich in calcium, fiber, protein, zinc, and magnesium. Many also believed that millets aid in digestion, improve overall health, and help increase hemoglobin levels (Hb). This suggests that despite higher levels of millet production and daily usage in Karnataka, there is a gap in formal awareness or health communication about millet benefits.

When asked about ways to promote household millet use, Telangana respondents mostly emphasized reducing costs and increasing availability in ration shops. In Karnataka, the top suggestion was to ensure easier market availability, reflecting the state's emphasis on self-production and localized consumption. Similarly, suggestions to promote millet use at the community level echoed these differences. Telangana participants focused more on price reduction and integrating millets into the public distribution system, while Karnataka respondents emphasized improving market access and millet availability.

State-wise Conclusions and Recommendations

Karnataka

Conclusions

- The fortified ragi malt, particularly the milk-based preparation (K1), demonstrated consistently high acceptability in both sensory evaluation panels and school-based feedback sessions. Children reported good taste, aroma, and satiety, contributing to high overall preference scores.
- The quality of preparation emerged as a key determinant of acceptance. When viscosity, texture, and serving temperature were optimal, children consumed the product fully; however, poorly mixed or over/under-thick preparations led to reduced consumption.
- A rigid weekly menu plan has resulted in predictable dislikes, with specific items such as brinjal curry repeatedly flagged as unappealing. This leads to avoidable plate waste and reduced nutritional benefit.

- Agriculture-nutrition linkages are limited. While ragi dominates production and supply chains, there is limited seed availability for other nutrient-rich millets, and high processing costs limit diversification.
- Infrastructure constraints such as inadequate kitchen facilities, limited storage, and lack of clean water, pose operational challenges in both Anganwadi Centres (AWCs) and schools.
- Although there is community willingness to participate in school nutrition discussions, there is no formal mechanism for capturing and acting on feedback from parents and local committees.

Recommendations

- Standardize product preparation through clear SOPs and regular training for cooks, ensuring optimal viscosity, texture, and serving temperature are maintained.
- Introduce limited menu flexibility at the district level to substitute persistently disliked items with locally preferred, nutritious alternatives while preserving dietary diversity.
- Enhance certified seed availability for minor millet varieties and promote decentralized processing facilities (such as de-husking units) to reduce dependence on a single millet type.
- Invest in basic kitchen upgrades, safe storage spaces, and clean water facilities to support safe and hygienic food preparation.
- Establish formal parent-teacher food monitoring committees to conduct monthly quality reviews and provide feedback to programme managers, ensuring community perspectives are integrated into decision-making.

Telangana

Conclusions

- The fortified ragi malt was well accepted in schools and Anganwadis, though the water-based preparation, currently standard in Telangana scored slightly lower in taste and aroma compared to the milk-based version tested in Karnataka.
- Consistency in preparation, particularly ensuring the correct thickness, was identified as a critical factor in maintaining consumption levels. Variations in texture between centres led to inconsistent acceptance.
- The Take-Home Ration (THR)/Balamrutham is prone to household diversion, either shared with other family members or repurposed in non-target foods. The monotony of the product's flavour was also reported as a barrier to daily use.
- Egg supply and quality control remain inconsistent across ICDS and MDM platforms, leading to occasional non-distribution and dissatisfaction among beneficiaries.
- Weak market linkages for millets persist, with limited government buy-back arrangements to assure farmers of stable demand.
- Parents expressed strong support for the inclusion of ragi malt but suggested expanding variety in the menu, particularly with fruits and snacks, to improve child enthusiasm and attendance.

Recommendations

- Introduce the milk-based ragi malt preparation where feasible, alongside training for cooks on preparation standards to ensure consistency in viscosity and flavour.
- Redesign the THR into smaller, nutrient-dense sachets with clear preparation instructions to reduce diversion and improve adherence, and consider adding flavour variations to enhance palatability.
- Strengthen egg procurement processes by enforcing weight and quality standards, introducing backup suppliers, and ensuring timely distribution.
- Incorporate a weekly fruit day and nutrient-rich snacks (e.g., groundnut or til-chikki) into the menu, while allowing some flexibility for local menu substitutions.
- Develop formal millet market support systems, such as assured procurement and integration into ICDS/PDS/MDM menus, to create steady demand and farmer incentives.
- Institutionalize structured feedback mechanisms with parent participation to identify and resolve programme issues more effectively.

Conclusion (Overall)

- High acceptability of fortified ragi malt across users: Caregivers rated both versions highly on a 9-point hedonic scale (overall ≈8–9/9). A semi-trained panel preferred the milk-based K1 for taste and aroma (significantly higher), while other attributes were comparable. Students described feeling fuller/energetic and acceptance improved with repeated exposure.
- School implementation is broadly feasible but quality hinges on preparation consistency and basic infrastructure: School in-charges reported wide acceptance of ragi malt when cooks are trained and texture is right; inconsistent preparation triggers refusals.
- Recurring programme bottlenecks in ICDS/Schools: Egg supply and quality issues; helper (aayah) vacancies; hygiene constraints (water/handwashing, storage); heavy digital/reporting load; and resistance to spot feeding among PLW. These were echoed by supervisors/CDPOs/AWWs in both states.
- Menu rigidity leads to predictable dislikes and waste. “Brinjal day” is consistently unpopular; students, parents, and schools mentioned about limited flexibility and asked for more variety (fruits, groundnut chikki).
- THR/Balamrutham is often diverted or repurposed; smaller nutrient-dense formats are preferred. Supervisors cited monotony, over-prescription, and household repurposing; they suggest compact, dense formats to curb misuse. AWWs also reported misuse and the need for counselling.
- Agriculture-nutrition disconnect persists. Telangana officers flagged weak market linkages/buy-back; they endorsed integrating millets into ICDS/PDS/MDM to generate demand. Karnataka officers highlighted ragi-centrism, seed constraints for minor millets, and processing costs; they recommended seed access and decentralized processing.
- Community engagement is strong but feedback loops are weak. Parents trust teachers, want a say in menus/monitoring, and ask for hygiene checks and fruits/snacks; formal avenues for this are limited.

Recommendations (Overall)

Product & preparation

- Use milk-based preparation (K1) where feasible to maximize palatability; standardize viscosity/SOPs to avoid lumps and “too thin/thick” complaints.
- Introduce flavour variants/age-specific options to reduce monotony (extend the Balamrutham Plus logic).

Extension to Anganwadi Centres

- ·Given the high compliance and strong acceptability of fortified ragi malt among users, there is potential to extend the intervention to other Anganwadi Centres. Currently, under the ICDS and related nutrition programmes, children aged 3–6 years at Anganwadi Centres typically receive a structured feeding schedule comprising a mid-morning snack (e.g., boiled egg, mini-meal), a hot cooked lunch, and an evening snack. Any addition of fortified ragi malt into this existing framework should be preceded by a feasibility assessment to ensure that it complements current nutritional provisions, aligns with dietary diversity goals, and does not displace existing nutrient-dense foods. This assessment should consider operational logistics, cost implications, supply chain integration, and the potential impact on the nutritional balance of the overall daily diet provided at Anganwadi Centres.

Impact Evaluation Before Scale-Up

- ·Before scaling to other parts of India, conduct a robust impact evaluation including cost-benefit analyses to assess nutritional outcomes, feasibility, and economic viability.

Menu diversification & micronutrient density

- ·Add weekly fruits and iron-rich snacks (groundnut/til chikki, dry-fruit laddus) through small pilots, then scale.
- ·Allow limited district-level menu flexibility to replace persistently disliked items (e.g., brinjal curry) with locally acceptable alternatives

THR reform

- ·Shift to smaller, nutrient-dense sachets and clear use-instructions to curb diversion; consider simple flavour variety

Supply chain & QA

- ·Tighten egg procurement/QA (weight thresholds, backup vendors), improve stock reliability for eggs/THR.
- ·Address hygiene gaps (clean water/handwashing, storage, utensils).

Human resources & capacity

- Fill aayah vacancies, and schedule regular refresher trainings (preschool pedagogy, counselling, app use; hands-on recipe demos).

Digital systems

- Provide offline/low-bandwidth modes, reduce duplication between paper and app, and give pragmatic troubleshooting support.

Community engagement & accountability

- Create school/ICDS food monitoring committees with parents and students; institutionalize monthly menu/ quality review and feedback-to-action tracking.
- Continue demonstrations/Poshan events (how ragi malt is made; myth-busting on eggs/millets) to reinforce home replication.

Equity & cultural sensitivity

- During religious periods or for pregnant and lactating women with constraints, allow acceptable alternates or THR options while counselling to maintain protein/micronutrient intake.

Infrastructure

- Invest in kitchens, safe storage, handwashing stations, seating/play areas—especially in single-room AWCs/schools.

Agriculture-nutrition convergence

- In Telangana, pilot buy-back/assured procurement and local ICDS/PDS/MDM millet inclusion to stabilize markets and demand. In Karnataka, expand certified seed access beyond ragi and decentralized processing (de-husking) with SHG/FPO support.

Malted Ragi as a Strategic Dietary Intervention

- Considering the high acceptability, improved palatability, and superior nutritional profile of malted ragi over regular ragi, it is recommended that malted ragi formulations be prioritised for integration

·into ICDS and school feeding programmes. The malting process not only enhances the bioavailability of key micronutrients such as calcium and iron by reducing anti-nutritional factors like phytates, but also improves digestibility and imparts a naturally sweeter flavour, thereby increasing compliance among children and other target groups. Programmatic adoption of malted ragi can help reduce plate waste, address micronutrient deficiencies more effectively, and improve dietary diversity when combined with complementary menu planning. Before large-scale rollout, a structured impact evaluation, including sensory acceptance, nutritional outcomes, cost–benefit analysis, and supply chain feasibility, should be undertaken. Based on these findings, malted ragi-based products can then be scaled to other parts of India, ensuring both nutritional efficacy and sustainability within existing government nutrition delivery systems.

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ANNEXURES

Annexure: Ethics Approval

Certificate of Approval

Institutional Ethics Committee
National Institute of Nutrition (ICMR)
Ministry of Health and Family Welfare
Government of India
JAMAI-OSMANIA, HYDERABAD – 500 007
Registration No: EC/NEW/INST/2021/1206

BOARD RECOMMENDATIONS

Review process

New Review ☑ Revised Review ☐ Continued Review ☐ Expedited Review ☐

Date of Previous review, if it is revised proposal: Dt: /Not applicable☑

Approval Status

Approved ☑ Disapproved ☐ Table ☐

Period of approval

One Year ☑ Six Months ☐ Three Months ☐ Other ☐

Reporting Interval

Annual ☑ Six Monthly☐ Quarterly ☐ Other ☐

Date of validity of approval : 09th December 2024

Date of expiry of validity of approval: 08th December 2025

NIN Protocol Number: **02/IV/2024**

The Following aspects are approved:

Title: "Exploring the Implementation, Delivery, and Utilization of Various Interventions Through ICDS and Schools Across Telangana and Karnataka: A Mixed Method Study."

Principal Investigators & Guide: Dr. Hemant Mahajan, Scientist D, ICMR-NIN ,
Dr.Devraj P., Scientist D, ICMR-NIN

Sponsor: ICMR-NIN

Comments: All queries raised by various IEC members were replied and found to be satisfactory.

Hence, Approved

Approval includes: Title, protocol, Subject information sheet and informed consent form.

Approval is granted subject to: Nil.

This is to certify that the information contained herein is true and correct as reflected of the Institutional Ethics Committee, National Institute of Nutrition (IEC-NIN). WE CERTIFY THAT IEC IS IN FULL COMPLIANCE WITH GUIDE LINES LAID BY THE ICMR

CHAIRPERSON
Institutional Ethics Committee (IEC)
National Institute of Nutrition
Tarnaka, Hyderabad-500007.

Chairman: Dr. P. Prakash Babu Date: 09th December 2024

MEMBER SECRETARY
Institutional Ethical Committee
ICMR-National Institute of Nutrition
Jamai-Osmania, Hyderabad

Member Secretary: Dr. P. Raghavendra Date: 09th December 2024

PTO

Annexure. Sai Sure Product information

Sr No.	Ingredients	Per 100 grams
1	Ragi Flour	82.6
2	Salt	0.8
3	Cinnamon	0.1
4	Rice Flour	15.5
5	Turmeric Powder	0.1
6	Mineral Premix	0.25
7	Vitamin Premix	0.25
8	Top up Vitamins	0.40
	Total	100.0%

Label Claim	100gm	10 gm serving	% RDA
Total Energy (Kcal)	310	31	2.58
Energy From Fat (kcal)	14.2	1.42	-
Protein(g)	6.6	0.66	2.28
Total Fat(g)	1.60	0.16	0.53
MUFA(g)	0.43	-	-
PUFA(g)	0.37	-	-
Saturated Fat(g)	0.23	-	-
Trans Fat(g)	0	-	-
Cholesterol(mg)	0	-	-
Total Carbohydrate(g)	66.7	6.67	3.34
Dietary Fibre (g)	9.7	0.97	4.85
Sugar(g)	0.0	-	-
NUTRIENTS: Minerals			
Sodium (mg)	320.0	16.00	1.33
Potassium (mg)	388.0	19.40	1.08
Calcium (mg)	303.0	15.15	2.75
Phosphorous (mg)	223.0	11.15	2.03
Magnesium (mg)	124.0	6.20	3.44
Iron (mg)	37.5	2.75	25.00
Zinc (mg)	20.0	1.63	25.00
Iodine (mcg)	337	20.00	20.00
Selenium (mcg)	100.0	8.00	25.00
Copper (mcg)	626.0	31.30	5.22
Vit A (mcg)	3.1	0.31	-
Vit D (mcg)	30.0	3.00	25.00
Vit B1 (mg)	3.0	3.00	25.00
Vit B2 (mg)	4.0	0.40	25.00
Vit B3 (mg)	1.0	0.10	0.90
Vit B6 (mg)	5.0	0.50	25.00
Vit B7 (mcg)	1.0	0.10	0.24
Vit B9 (mcg)	500.0	50.00	25.00
Vit 12 (mcg)	6.3	0.63	25.00
Vit C (mg)	325	32.5	72.2

Annexure: Processing Techniques for Finger Millet

Finger millet (Eleusine coracana) is widely recognized for its dense nutrient profile, including complex carbohydrates, high dietary fiber, calcium, iron, and polyphenolic compounds. However, in its raw form, the grain's nutritional potential is constrained by antinutritional factors such as phytates and tannins, which hinder mineral bioavailability and protein digestibility (Nickhil, C et al., 2025; Malleshi et al., 2025). Traditional processing methods, including germination, soaking, and roasting, are effective in enhancing nutrient bioavailability and reducing antinutrient content (Malleshi et al., 2025; Kumar et al., 2021; Rajkumar H et al., 2024).

Processing techniques:

- **Soaking** is typically employed as a preparatory step before germination, as it promotes the leaching of water-soluble antinutrients such as phytates and tannins, thereby enhancing protein and mineral digestibility (Malleshi et al., 2025; Krishnan et al., 2012). However, this process may also result in minor losses of soluble vitamins and minerals into the soaking medium (Malleshi et al., 2025; Shobana & Malleshi, 2007). In finger millet, soaking durations ranging from 12 to 72 h are commonly reported, but in our study, a 24 h soaking period was adopted. This pre-treatment step is crucial, as it initiates metabolic activity, softens the grain coat, stimulates enzymatic activity, and primes the seed for germination.
- **Germination** markedly improves the nutritional profile of finger millet by breaking down starch into simple sugars, enhancing amino acid availability, and increasing vitamin C and certain B-vitamins. Activation of phytase reduces phytates, thereby improving the bioavailability of minerals such as calcium, iron, and zinc (Malleshi et al., 2025; Kumar et al., 2021; Mbithi-Mwikya et al., 2000; Dharmaraj et al., 2020). It also enhances antioxidant potential through the release of bound phenolic compounds (Malleshi et al., 2025; Rajkumar H et al., 2024; Sharma & Gujral, 2010). In our study, three finger millet varieties (GPU-28, VL-Mandua-376, and GPU-67) were germinated for 24-72 h, which significantly increased protein content, highest in VL-Mandua-376, and progressively enhanced insoluble dietary fibre with longer germination. Phytonutrient levels showed a dynamic trend: an initial decline at 24 h, recovery at 48 h due to phenolic release, and a reduction by 72 h as sprout elongation diluted pigment-rich tissues (Unpublished: Nikhita et al., 2025).
- **Roasting** improves the sensory profile of finger millet and enhances starch digestibility through gelatinization. It reduces heat-labile vitamins but inactivates polyphenol oxidase, lowering tannin content (Nanje Gowda et al., 2025; Sharma & Gujral, 2010). In certain varieties, Maillard reactions during roasting enhance phenolic compounds, contributing to antioxidant activity (Martinez & Whitaker, 1995). Roasting preserves macronutrient stability while improving flavour and consumer acceptability. In our results, roasting slightly increased protein and fibre content and produced variety-specific effects on phytonutrients. GPU-28 and GPU-67 showed reductions in Total Polyphenol Content and Total Flavonoid Content, while VL-Mandua-376 showed an increase, likely due to Maillard reactions and enzymatic browning. Heat also inactivated polyphenol oxidase, reducing enzymatic degradation of phenolics (Nanje Gowda et al., 2025; Sharma & Gujral, 2010) (Unpublished: Nikhita et al., 2025).
- **Combined Processing (Germination + Roasting)**
  The most striking finding was that 48 h germination followed by roasting yielded the highest retention of phytonutrients, while also enhancing fibre and protein digestibility across varieties. This sequential approach balances nutrient enrichment and antioxidant preservation. (Unpublished: Nikhita et al., 2025)

By strategically combining these processing methods, finger millet's nutritional potential can be fully unlocked, making it a valuable food-based strategy to combat malnutrition and hidden hunger.

In our study, we prepared the finger millet-based Read- to -use Complementary food (RUCF) using a sequence of processing steps, including 24-hour soaking, 48-hour germination, and roasting. Based on our experimental results, these treatments were deliberately selected as they promoted maximum nutrient retention while effectively reducing antinutritional factors. This optimized processing of finger millet ensured a product rich in calcium, magnesium, and fibre, with improved mineral bioavailability and antioxidant potential. The inclusion of date powder as a natural sweetener further elevated the nutrient density by providing fibre, iron, and potassium, while avoiding the drawbacks of refined sugar. (Unpublished: Nikhita et al., 2025).

When tested among MAM preschool children, the processed finger millet-based (RUCF) product demonstrated tangible nutritional benefits. Children receiving FMD showed higher improvements in weight gain, WHZ scores, and body composition parameters such as mineral mass, skeletal muscle mass, body cell mass, and bone mineral content compared to the wheat/rice-based supplement. This validates how processing techniques, when systematically applied, can transform finger millet into a highly functional supplementary food that supports both growth and recovery in malnourished children (Unpublished: Nikhita et al., 2025).

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Annexure. Data Collection Tools

In-Depth Interviews Guide for Different Stakeholders

Qualitative Interview Director Agriculture or Relevant Stakeholders

Introduction

1. **Purpose of the Interview:**
   - "We are conducting this interview to understand the availability of millets in the target regions, strategies for their utilization, and the dietary patterns and constraints associated with their use."
2. **Consent and Confidentiality:**
   - Ensure the participant that their responses will be confidential and request verbal or written consent.
3. **Warm-Up Questions:**
   - "Can you briefly describe your role in the Agriculture Department and your experience working with millet-related programs or initiatives?"

Section 1: Availability of Millets

1. **Current Availability:**
   - **Main Question:**
     - "What is the current availability of millets in the target regions?"
   - **Probes:**
     - "Are millets widely grown locally, or are they sourced from other regions?"
     - "Which types of millets are most commonly available?"
     - "How has millet availability changed over the years?"
2. **Production and Distribution:**
   - **Main Question:**
     - "What factors influence millet production and distribution in these regions?"
   - **Probes:**
     - "Are there government programs or incentives to promote millet cultivation?"
     - "How do market dynamics (e.g., demand, pricing) impact millet production?"
     - "What roles do local farmers and cooperatives play in the production and supply chain?"
3. **Challenges in Availability:**
   - **Main Question:**
     - "What challenges do you face in ensuring a steady supply of millets in these regions?"
   - **Probes:**
     - "Are there issues with land use, water availability, or climate factors?"
     - "What infrastructural or logistical challenges exist in transporting millets to markets?"

Section 2: Strategies for Millet Utilization

1. **Promotion Strategies:**
   - **Main Question:**
     - "What strategies are currently being employed to promote the utilization of millets?"
   - **Probes:**
     - "Are there awareness programs or campaigns to encourage millet consumption?"
     - "What role do schools, Anganwadi centers, or other institutions play in promoting millet use?"
     - "Are there any collaborations with private sectors or NGOs to enhance millet utilization?"
2. **Support for Farmers:**
   - **Main Question:**
     - "What support systems are in place to help farmers cultivate and market millets?"
   - **Probes:**
     - "Are there subsidies or financial incentives for millet cultivation?"
     - "Do farmers receive training or technical guidance on millet farming?"
3. **Policy and Regulation:**

- **Main Question:**
  - "What policies or regulations are in place to promote millets in this region?"
- **Probes:**
  - "Are there government procurement schemes for millets?"
  - "What role does the agriculture department play in shaping these policies?"

Section 3: Dietary Patterns and Constraints

1. **Current Dietary Patterns:**
   - **Main Question:**
     - "How are millets currently included in the diets of people in this region?"
   - **Probes:**
     - "Which groups (e.g., children, adults, elderly) consume millets the most?"
     - "Are there specific traditional dishes or preparations involving millets?"
     - "Has millet consumption changed over time?"
2. **Constraints in Utilization:**
   - **Main Question:**
     - "What are the main barriers to the utilization of millets in daily diets?"
   - **Probes:**
     - "Are there cultural or taste preferences that limit millet use?"
     - "How do factors like cost, availability, or awareness influence millet consumption?"
     - "Are there any perceptions about the health benefits or drawbacks of consuming millets?"
3. **Consumer Awareness:**
   - **Main Question:**
     - "How aware are people of the nutritional benefits of millets?"
   - **Probes:**
     - "Are there educational campaigns about millet nutrition?"
     - "What role do schools or community programs play in spreading this awareness?"

Section 4: Recommendations and Future Directions

1. **Suggestions for Improvement:**
   - **Main Question:**
     - "What steps can be taken to improve the availability and utilization of millets in this region?"
   - **Probes:**
     - "What role should the government play in these efforts?"
     - "How can local communities and farmers be better involved?"
     - "Are there successful examples from other regions that can be implemented here?"
2. **Future Policies and Programs:**
   - **Main Question:**
     - "What new policies or programs would you recommend to enhance millet cultivation and consumption?"
   - **Probes:**
     - "Do you see a role for public-private partnerships in this effort?"
     - "How can the agriculture department work more closely with other sectors (e.g., health, education) to promote millets?"

Conclusion

1. **Final Thoughts:**
   - "Is there anything else you would like to share about the production, availability, or utilization of millets in this region?"
2. **Thank the Participant:**
   - Thank the participant for their time and valuable insights.

Interview Guide for ICDS Officers (Supervisors)

Introduction

Briefly explain the purpose of the interview:
"We are conducting this interview to understand the implementation and utilization of nutritional interventions, including the fortified ragi mix, through ICDS and schools."
Assure confidentiality and obtain verbal or written consent.
Start with a warm-up question:
"Can you tell me a little about your role and responsibilities as an ICDS officer?"

Section 1: Implementation of Nutritional Interventions

Overview of Interventions:

Main Question:

"Can you describe the key nutritional interventions currently implemented in your area through ICDS or schools?"

Probes:

- "Which interventions are the most widely implemented and why?"
- "Are there any differences in implementation between rural and urban areas?"
- "How are these interventions communicated to beneficiaries?"

Fortified Ragi Mix (if initiated):

Main Question:

- "Has the fortified ragi mix been introduced in your region? If yes, how is it being implemented?"

Probes:

- "What steps were taken to initiate this intervention?"
- "What training or resources were provided to the Anganwadi staff or school staff for its implementation?"
- "Are there any guidelines or protocols you follow for distributing the fortified ragi mix?"

Monitoring and Supervision:

Main Question:

- "How do you monitor the implementation of these interventions at Anganwadi centers or schools?"

Probes:

- "Are there regular field visits or review meetings?"
- "What challenges do you face in supervising these activities?"

Section 2: Accessibility, Acceptability, and Utilization

Accessibility:

Main Question:

"How accessible are these interventions, including the fortified ragi mix, to ICDS beneficiaries and school children?"

Probes:

- "Are there any logistical challenges in distributing these interventions to all areas?"
- "Are there any groups or regions that face more difficulty in accessing these interventions?"
- "How do you address supply shortages or delays?"

Acceptability:

Main Question:

"What is the feedback from beneficiaries (children, mothers, school staff) about the nutritional interventions?"

Probes:

"Do beneficiaries like the taste, texture, or preparation process of the fortified ragi mix?"

"Are there any cultural or dietary preferences that affect the acceptance of these interventions?"
"How do you handle complaints or suggestions from beneficiaries?"

Utilization:

Main Question:

"How are these interventions, including the fortified ragi mix, being utilized by the beneficiaries?"

Probes:

"Do the beneficiaries consume the fortified ragi mix regularly, or do they use it differently?"
"Have you observed any patterns of sharing, storing, or repurposing the distributed food items?"
"What roles do schools or Anganwadi workers play in ensuring proper utilization?"

Section 3: Challenges and Opportunities

Challenges in Implementation:

Main Question:

"What are the main challenges you face in implementing nutritional interventions, including the fortified ragi mix?"

Probes:

"Are there resource or staffing limitations?"
"Do you face resistance or lack of awareness from the community?"
"Are there challenges in coordinating with other stakeholders, such as schools or local leaders?"

Opportunities for Improvement:

Main Question:

"What opportunities do you see for improving the implementation of these interventions?"

Probes:

"Are there any strategies or innovations that have worked well in other regions?"
"What additional support or resources would make implementation more effective?"

Section 4: Feedback and Recommendations

Overall Assessment:

Main Question:

"How do you assess the overall success of these interventions in meeting their objectives?"

Probes:

"Are there specific indicators or outcomes you track to measure success?"
"Do you think these interventions are reaching the right beneficiaries?"

Recommendations:

Main Question:

"What recommendations would you make for improving the accessibility, acceptability, and utilization of these interventions?"

Probes:

"Do you think involving local stakeholders could improve implementation?"
"Are there specific policy or operational changes you would suggest?"

Conclusion

Ask if they have any additional comments:

"Is there anything else you would like to share about the implementation or utilization of these nutritional interventions?"

Thank the participant for their time and valuable input.

In-Depth Interview Guide for Child Development and Program Officer (CDPO)

This interview guide is tailored to retrieve relevant information from CDPOs regarding the implementation, accessibility, acceptability, and utilization of nutritional interventions (including fortified ragi mix) as part of the ICDS and school programs. Probes are included to encourage detailed responses.

Introduction

1. Purpose of the Interview:
   - "We are conducting this interview to gather insights about the implementation and utilization of nutritional interventions, particularly the fortified ragi mix, through ICDS and schools."
2. Consent and Confidentiality:
   - Assure the participant of confidentiality and seek consent.
3. Warm-Up:
   - "Can you briefly describe your role and responsibilities as a CDPO in this district/block?"

Section 1: Overview of Interventions

1. General Overview:
   - Main Question:
     - "What are the key nutritional interventions currently being implemented under ICDS in your area?"
   - Probes:
     - "Which interventions are most commonly used, and why?"
     - "Are there specific programs tailored for different age groups or target populations?"
2. Role in Implementation:
   - Main Question:
     - "What role do you play in ensuring the effective implementation of these interventions?"
   - Probes:
     - "How do you coordinate with Anganwadi workers and schools for implementation?"
     - "What tools or resources do you use to monitor progress?"
3. Fortified Ragi Mix (if initiated):
   - Main Question:
     - "Has the fortified ragi mix been introduced in your region? If yes, how is it being implemented?"
   - Probes:
     - "What steps were taken to initiate its distribution?"
     - "What feedback have you received from Anganwadi workers and beneficiaries?"

Section 2: Accessibility

1. Accessibility of Interventions:
   - Main Question:
     - "How accessible are the ICDS interventions, including fortified ragi mix, for beneficiaries in your area?"
   - Probes:
     - "Are there any geographic or logistical barriers to reaching remote or underserved areas?"
     - "What challenges do you face in ensuring that all intended beneficiaries receive the interventions?"
2. Distribution Mechanism:
   - Main Question:
     - "How are nutritional interventions distributed to Anganwadi centers and schools?"
   - Probes:
     - "Are there delays or shortages in supplies?"
     - "What mechanisms are in place to ensure timely delivery?"

Section 3: Acceptability

1. Beneficiary Feedback:
   - Main Question:

        - "What feedback have you received about the acceptability of these interventions, especially the fortified ragi mix?"
    - Probes:

2. Engagement and Awareness:
    - Main Question:
        - "How are nutritional interventions distributed to Anganwadi centers and schools?"
    - Probes:
        - "Are there delays or shortages in supplies?"
        - "What mechanisms are in place to ensure timely delivery?"

Section 4: Utilization

1. Patterns of Utilization:
    - Main Question:
        - "How are the distributed nutritional products, including fortified ragi mix, being utilized by beneficiaries?"
    - Probes:
        - "Are there any observations of underutilization, such as sharing or selling the products?"
        - "Do beneficiaries consume the products as intended or repurpose them?"
2. Role of Anganwadi Workers and Schools:
    - Main Question:
        - "How do Anganwadi workers and schools contribute to ensuring the proper utilization of these interventions?"
    - Probes:
        - "Do they provide instructions on preparation and consumption?"
        - "Are there any monitoring mechanisms to track usage?"

Section 5: Challenges and Opportunities

1. Implementation Challenges:
    - Main Question:
        - "What are the key challenges you face in implementing these interventions, including the fortified ragi mix?"
    - Probes:
        - "Are there issues related to funding, staffing, or logistics?"
        - "Do you face resistance or lack of awareness from beneficiaries or other stakeholders?"
2. Opportunities for Improvement:
    - Main Question:
        - "What opportunities do you see for improving the accessibility, acceptability, and utilization of these interventions?"
    - Probes:
        - "Are there successful practices or strategies from other regions that could be adopted?"
        - "What additional resources or support would enhance the effectiveness of these programs?"

Section 6: Monitoring and Evaluation

1. Monitoring Mechanisms:
    - Main Question:
        - "How do you monitor the implementation and impact of these interventions?"
    - Probes:
        - "What indicators or metrics do you track?"
        - "Are there regular review meetings or feedback mechanisms?"
2. Evaluating Success:
    - Main Question:

        - "From your perspective, how do you assess the success of these interventions?"
    - Probes:
        - "Do you focus on specific outcomes such as improved nutrition, attendance in schools, or health metrics?"
        - "Are there any gaps in the current monitoring system?"

Section 7: Recommendations

1. Recommendations for Improvement:
    - Main Question:
        - "What recommendations would you make for improving the overall implementation of nutritional interventions?"
    - Probes:
        - "What role can local stakeholders, such as community leaders or self-help groups, play?"
        - "What changes would you suggest in policies or guidelines to address existing challenges?"
2. Scaling Up Fortified Ragi Mix:
    - Main Question:
        - "If the fortified ragi mix intervention is not yet initiated, how feasible do you think it is to incorporate it into the current framework?"
    - Probes:
        - "What steps would be needed to prepare for its rollout?"
        - "What resources, training, or awareness efforts would be essential?"

Conclusion

1. Additional Comments:
    - "Is there anything else you would like to share about these programs or the challenges and opportunities they present?"
2. Thank the participant for their time and insights.

In-Depth Interview Guide for School In-Charges

This interview guide is designed to explore the perspectives of school in-charges on the acceptance and compliance with nutritional interventions (including the fortified ragi mix) delivered at schools. Probes are included to elicit detailed, nuanced responses.

Introduction

1. Purpose of the Interview:
   - "We are conducting this interview to understand your role in implementing nutritional interventions, including the fortified ragi mix, and to gather your insights on their accessibility, acceptability, and utilization among school children."
2. Consent and Confidentiality:
   - Ensure the participant's responses will remain confidential and request verbal or written consent.
3. Warm-Up Question:
   - "Can you briefly describe your role as a school in-charge and how long you have been managing the school?"

Section 1: Implementation of Nutritional Interventions

1. Overview of Interventions:
   - Main Question:
     - "What are the key nutritional interventions currently being implemented at your school?"
   - Probes:
     - "Which interventions are the most commonly used, and why?"
     - "How are these interventions integrated into the school routine?"
2. Fortified Ragi Mix (if initiated):
   - Main Question:
     - "Has the fortified ragi mix intervention been introduced at your school? If yes, can you describe how it is being implemented?"
   - Probes:
     - "What steps are followed for distributing the fortified ragi mix to children?"
     - "Have you received any specific guidelines or training for its implementation?"
3. Monitoring and Reporting:
   - Main Question:
     - "How do you monitor the implementation of these nutritional interventions?"
   - Probes:
     - "Are there regular checks to ensure the interventions are reaching all children?"
     - "Do you report progress or challenges to any higher authorities?"

Section 2: Accessibility

1. Access to Nutritional Interventions:
   - Main Question:
     - "Do all children in your school have access to the nutritional interventions provided?"
   - Probes:
     - "Are there any groups of children (e.g., by gender or economic background) who face challenges in accessing these interventions?"
     - "What steps are taken to ensure that all children, including those from remote areas, can access these interventions?"
2. Challenges in Accessibility:
   - Main Question:
     - "What challenges, if any, do you face in ensuring the availability and distribution of nutritional interventions?"
   - Probes:
     - "Are there issues with supply delays, quantity, or quality?"

- "How do you address any accessibility issues that arise?"

Section 3: Acceptability

1. Feedback from Children:
   - Main Question:
     - "What is the children's feedback on the nutritional interventions, especially the fortified ragi mix?"
   - Probes:
     - "Do children like the taste, texture, or preparation of the fortified ragi mix?"
     - "Have you noticed any reluctance among children to consume the provided foods?"
2. Feedback from Parents and Teachers:
   - Main Question:
     - "What feedback have you received from parents and teachers about these nutritional interventions?"
   - Probes:
     - "Do parents express any concerns about the interventions?"
     - "Are teachers supportive of promoting these interventions among children?"
3. Cultural and Dietary Preferences:
   - Main Question:
     - "Do cultural or dietary preferences influence the acceptability of these interventions?"
   - Probes:
     - "Are there specific foods or ingredients that are more readily accepted?"
     - "How do you address issues of acceptability linked to cultural factors?"

Section 4: Utilization and Compliance

1. Utilization Patterns:
   - Main Question:
     - "How are the nutritional interventions, including the fortified ragi mix, utilized by the children?"
   - Probes:
     - "Do children consume the foods as intended, or are there cases of sharing or wastage?"
     - "Are there variations in utilization among different age groups or genders?"
2. Ensuring Compliance:
   - Main Question:
     - "What steps are taken to ensure that children comply with consuming the provided nutritional interventions?"
   - Probes:
     - "Do teachers or staff monitor children during meal times?"
     - "Are there any awareness programs to encourage regular consumption?"
3. Role of School Staff:
   - Main Question:
     - "What role do teachers and school staff play in ensuring the proper utilization of these interventions?"
   - Probes:
     - "Do they provide instructions or assistance to children?"
     - "Do they address any complaints or issues raised by children about the interventions?"

Section 5: Challenges and Recommendations

1. Challenges in Implementation:
   - Main Question:
     - "What are the key challenges you face in implementing these nutritional interventions?"
   - Probes:
     - "Are there administrative, logistical, or resource-related issues?"

- "How do you address any accessibility issues that arise?"

1. Recommendations for Improvement:
   - Main Question:
     - "What recommendations would you make to improve the implementation and utilization of these interventions?"
   - Probes:
     - "Are there specific changes in supply chain or guidelines that would help?"
     - "What role can schools play in enhancing the success of these interventions?"

Section 6: Community Engagement

1. Community Awareness and Involvement:
   - Main Question:
     - "What efforts have been made to raise awareness about these nutritional interventions among the school community?"
   - Probes:
     - "Do you involve parents, local leaders, or community groups in promoting these interventions?"
     - "What role does the school play in educating children about the importance of nutrition?"
2. Partnerships with ICDS or Other Stakeholders:
   - Main Question:
     - "How do you coordinate with ICDS workers or other stakeholders to support the implementation of these programs?"
   - Probes:
     - "Are there regular meetings or feedback mechanisms in place?"
     - "What additional support do you expect from ICDS or other agencies?"

Conclusion

1. Final Thoughts:
   - "Is there anything else you would like to share about the implementation or utilization of nutritional interventions in your school?"
2. Thank the Participant:
   - Thank the school in-charge for their time and valuable insights.

In-Depth Interview Guide for Parents

Introduction

1. Purpose of the Interview:
   - "We are conducting this interview to understand your experience with the nutritional interventions provided to your child through ICDS and schools, including the fortified ragi mix."
2. Consent and Confidentiality:
   - Assure the participant that their responses will remain confidential and obtain verbal or written consent.
3. Warm-Up Question:
   - "Can you tell us a little about your family and your child's current school or Anganwadi center?"

Section 1: Awareness and Understanding of Nutritional Interventions

1. Knowledge of Interventions:
   - Main Question:
     - "What do you know about the nutritional interventions provided to your child through the school or Anganwadi center?"
   - Probes:
     - "Have you heard about the fortified ragi mix or other food supplements?"
     - "Who informed you about these interventions (e.g., school staff, Anganwadi workers)?"
2. Purpose of Interventions:
   - Main Question:
     - "Why do you think these nutritional interventions are provided to children?"
   - Probes:
     - "Do you think they are important for your child's health or education?"
     - "Have you observed any changes in your child's health or activity levels since they started receiving these interventions?"

Section 2: Accessibility of Nutritional Interventions

1. Ease of Access:
   - Main Question:
     - "How easy is it for your child to receive these nutritional interventions, such as the fortified ragi mix, from their school or Anganwadi center?"
   - Probes:
     - "Are there times when the interventions are unavailable or delayed?"
     - "Does your child face any difficulties in accessing these interventions regularly?"
2. Challenges in Accessibility:
   - Main Question:
     - "Have you faced any challenges in ensuring your child receives these interventions?"
   - Probes:
     - "Are there issues with distribution, like shortages or poor quality?"
     - "Do you need to spend extra money or effort to make these interventions more accessible to your child?"

Section 3: Acceptability of Nutritional Interventions

1. Child's Feedback:
   - Main Question:
     - "What does your child think about the taste and quality of the food provided through these interventions?"
   - Probes:
     - "Do they enjoy eating the fortified ragi mix or other foods?"
     - "Have they ever complained about the food (e.g., taste, smell, or texture)?"

1. Parental Observations:
    - Main Question:
        - "What is your opinion about the food provided through these programs?"
    - Probes:
        - "Do you think the food is nutritious and suitable for your child?"
        - "Are there any concerns you have about its quality or safety?"
2. Cultural and Dietary Preferences:
    - Main Question:
        - "Does the food provided align with your family's cultural or dietary preferences?"
    - Probes:
        - "Are there any foods that your child doesn't eat due to cultural or personal preferences?"

"Do you feel the interventions consider local food habits?"

Section 4: Utilization and Compliance with Interventions

1. Consumption Patterns:
    - Main Question:
        - "How regularly does your child consume the food provided through these interventions?"
    - Probes:
        - "Do they eat it at school/Anganwadi center or bring it home?"
        - "Do they ever share or save the food instead of eating it?"
2. Encouragement at Home:
    - Main Question:
        - "How do you encourage your child to consume the food provided through these programs?"
    - Probes:
        - "Do you talk to them about the importance of eating nutritious food?"
        - "Do you prepare or modify the food (e.g., fortified ragi mix) at home to make it more appealing?"
3. Parental Support:
    - Main Question:
        - "What role do you think parents play in ensuring children utilize these nutritional interventions effectively?"
    - Probes:
        - "Do you feel other parents are aware of the importance of these programs?"
        - "Are there any ways you think parents can contribute more?"

Section 5: Perceived Impact of Nutritional Interventions

1. Child's Health and Development:
    - Main Question:
        - "Have you noticed any changes in your child's health or behavior since they started receiving these interventions?"
    - Probes:
        - "Do they appear more energetic or focused in school?"
        - "Have you noticed any improvements in their weight, height, or overall growth?"
2. Academic and Social Impact:
    - Main Question:
        - "Do you think these interventions help your child perform better in school?"
    - Probes:
        - "Have teachers or Anganwadi workers mentioned any positive changes in your child's participation or behavior?"
        - "Do these programs help reduce hunger during school hours?"

Section 6: Challenges and Recommendations

1. Challenges Faced:
   - Main Question:
     - "What challenges have you faced as a parent in relation to these nutritional interventions?"
   - Probes:
     - "Are there issues with communication, distribution, or the quality of the food?"
     - "Have you raised any concerns with school staff or Anganwadi workers?"
2. Suggestions for Improvement:
   - Main Question:
     - "What recommendations would you make to improve these interventions?"
   - Probes:
     - "Do you think additional types of food should be included?"

"Would you like more information or training on how to use the interventions at home?"

Section 7: Community Awareness and Involvement

1. Community Engagement:
   - Main Question:
     - "How well is the community informed about these nutritional interventions?"
   - Probes:
     - "Do you think parents understand the importance of these programs?"
     - "Have there been any community meetings or awareness programs related to these interventions?"
2. Role of Parents in Awareness:
   - Main Question:
     - "How can parents play a role in raising awareness about these interventions?"
   - Probes:
     - "Would you be willing to share your experiences with other parents?"
     - "What resources or support would help you become more involved?"

Conclusion

1. Final Thoughts:
   - "Is there anything else you would like to share about your experience with these nutritional interventions?"
2. Thank the Participant:
   - Thank the parent for their time and insights.

In-Depth Interview Guide for Children

Introduction

1. Purpose of the Interview:
   - "We want to talk to you about the food and other things you receive at school or Anganwadi. Your answers will help us understand how helpful these are and how you feel about them."
2. Consent and Confidentiality:
   - Explain that their answers are private, and they can skip any question they don't want to answer.
3. Warm-Up Questions:
   - "What's your name? How old are you?"
   - "Which school or Anganwadi do you go to? What's your favorite subject or activity there?"

Section 1: Awareness and Knowledge of Nutritional Interventions

1. Food Received:
   - Main Question:
     - "What kind of food or snacks do you get at school or Anganwadi?"
   - Probes:
     - "Do you know why they give you this food?"
     - "Who gives you the food, and when do you eat it?"
2. Fortified Ragi Mix:
   - Main Question:
     - "Have you ever received something called fortified ragi mix? Do you know what it is?"
   - Probes:
     - "What do you think about it? Does it taste good?"
     - "Do you know how it's prepared or who makes it?"

Section 2: Accessibility of Nutritional Interventions

1. Regular Access:
   - Main Question:
     - "Do you get this food every day or only sometimes?"
   - Probes:
     - "Have there been times when you didn't get the food? Why do you think that happened?"
     - "If you don't get the food, what do you do instead?"
2. Ease of Access:
   - Main Question:
     - "Is it easy for you to get the food at school or Anganwadi?"
   - Probes:
     - "Do you have to wait a long time to get it?"
     - "Do you ever feel like there isn't enough for everyone?"

Section 3: Acceptability of Nutritional Interventions

1. Taste and Preferences:
   - Main Question:
     - "Do you like the taste of the food you get at school or Anganwadi?"
   - Probes:
     - "What's your favorite food item they give you?"
     - "Are there any foods you don't like? Why not?"
2. Feedback to Adults:
   - Main Question:
     - "If you don't like the food, do you tell anyone about it?"
   - Probes:
     - "Who do you talk to about the food—teachers, Anganwadi workers, or parents?"
     - "Have they ever changed the food based on what you said?"

Section 4: Utilization and Compliance

1. Eating Habits:
   - Main Question:
     - "Do you eat all the food that they give you, or do you sometimes leave it?"
   - Probes:
     - "If you don’t eat it all, what do you do with the leftover food?"
     - "Do you ever share your food with friends or take it home?"
2. Family Influence:
   - Main Question:
     - "Do your parents or family talk to you about the food you get at school or Anganwadi?"
   - Probes:
     - "Do they encourage you to eat it?"
     - "Have they ever helped you prepare it, like the ragi mix?"
3. Changes in Behavior:
   - Main Question:
     - "Since you started getting this food, have you noticed any changes in how you feel or what you like to eat?"
   - Probes:
     - "Do you feel stronger or more active?"
     - "Have you started eating similar foods at home?"

Section 5: Impact of Nutritional Interventions

1. Feeling and Performance:
   - Main Question:
     - "How do you feel after eating the food you get at school or Anganwadi?"
   - Probes:
     - "Does it make you feel full or give you energy to play or study?"
     - "Do you think it helps you do better in school?"
2. Favorite Experiences:
   - Main Question:
     - "What’s the best thing about getting food at school or Anganwadi?"
   - Probes:
     - "Do you look forward to it every day?"
     - "Do you think all children should get food like this?"

Section 6: Suggestions and Recommendations

1. Suggestions for Improvement:
   - Main Question:
     - "If you could change something about the food you get, what would it be?"
   - Probes:
     - "Would you like more variety in the food?"
     - "Do you think the way the food is given to you could be better?"
2. Involvement in Decision-Making:
   - Main Question:
     - "Have you ever been asked about what food you like or what should be included?"
   - Probes:
     - "Do you think it would be helpful if children could give ideas about the food?"
     - "Would you like to help in preparing or deciding how the food is served?"

Conclusion

- Final Thoughts:
  - "Is there anything else you'd like to tell us about the food you get at school or Anganwadi?"
- Thank the Participant:
  - Thank the child for their time and responses and let them know their input is valuable.

Notes for Interviewers

- Keep the language simple and age-appropriate, especially for younger children.
- Use a friendly and non-judgmental tone to make the child comfortable.
- Avoid leading questions; let the child express their own thoughts and feelings.

This tool provides a child-friendly framework for gathering insights into the acceptance, compliance, and impact of nutritional interventions. The probes ensure deeper exploration of their experiences and opinions.

In-Depth Interview Guide for Anganwadi Workers

This guide is designed to collect detailed information from Anganwadi Workers about the delivery, acceptance, and compliance with nutritional interventions (including fortified ragi mix) delivered to children. It also explores contextual, operational, and stakeholder factors that influence implementation and acceptability. Probes are included for a thorough understanding.

Introduction

1. Purpose of the Interview:
   - "We are conducting this interview to understand your experiences with delivering nutritional interventions, including fortified ragi mix, to children and the factors that influence their implementation, acceptance, and compliance."
2. Consent and Confidentiality:
   - Assure the participant that their responses are confidential and request verbal or written consent.
3. Warm-Up Question:
   - "Can you tell us about your role as an Anganwadi Worker and how long you have been working in this position?"

Section 1: Delivery of Nutritional Interventions

1. Overview of Interventions:
   - Main Question:
     - "What are the key nutritional interventions you deliver to children at your Anganwadi center?"
   - Probes:
     - "Can you describe the food items or supplements provided, such as the fortified ragi mix?"
     - "What other interventions are offered to children and mothers?"
2. Fortified Ragi Mix:
   - Main Question:
     - "If the fortified ragi mix is provided in your center, how is it distributed to children and their families?"
   - Probes:
     - "How do you explain its benefits to the families?"
     - "What challenges, if any, do you face in distributing it?"
3. Role in Implementation:
   - Main Question:
     - "What is your role in ensuring the effective implementation of these interventions?"
   - Probes:
     - "Do you receive guidelines or instructions on how to distribute and monitor these interventions?"
     - "Do you coordinate with CDPOs, block officers, or other stakeholders for support?"
4. Monitoring and Reporting:
   - Main Question:
     - "How do you track the distribution and utilization of these interventions?"
   - Probes:
     - "Do you maintain records, and how often do you report to your supervisors?"
     - "What feedback do you receive from CDPOs or other officers about your work?"

Section 2: Acceptance of Nutritional Interventions

1. Feedback from Beneficiaries:
   - Main Question:
     - "What feedback have you received from children and parents about the food or supplements provided, including fortified ragi mix?"
   - Probes:
     - "Do families understand the importance of these interventions?"
     - "Have there been any complaints or suggestions regarding the quality or taste?"
2. Cultural and Dietary Preferences:
   - Main Question:

        - "Do cultural or dietary habits of the community affect the acceptance of these interventions?"
    - Probes:
        - "Are there foods that families or children avoid due to cultural reasons?"
        - "How do you handle resistance from beneficiaries who may not want to use these interventions?"
1. Strategies for Encouragement:
    - Main Question:
        - "What strategies do you use to encourage families and children to accept and use these interventions?"
    - Probes:
        - "Do you conduct awareness sessions or home visits?"
        - "Do you use visual aids or demonstrations to explain the benefits?"

Section 3: Compliance with Nutritional Interventions

1. Utilization Patterns:
    - Main Question:
        - "How do families and children utilize the food or supplements they receive?"
    - Probes:
        - "Do children consume it as intended, or do they share or save it?"
        - "Are there cases where families misuse or do not use the interventions?"
2. Monitoring Compliance:
    - Main Question:
        - "How do you monitor whether the beneficiaries are using the interventions correctly?"
    - Probes:
        - "Do you observe children consuming the food at the center or during home visits?"
        - "What do you do if you notice non-compliance?"
3. Challenges in Compliance:
    - Main Question:
        - "What challenges do you face in ensuring compliance with these interventions?"
    - Probes:
        - "Are there logistical barriers, such as delays in distribution?"
        - "Do beneficiary attitudes or misconceptions affect compliance?"

Section 4: Factors Influencing Implementation and Acceptability

1. Role of Stakeholders:
    - Main Question:
        - "How do stakeholders like the CDPO, block officers, and supervisors support or hinder the implementation of these interventions?"
    - Probes:
        - "Do you receive timely guidance and support from your supervisors?"
        - "Are there gaps in communication or coordination with higher authorities?"
2. Operational Management:
    - Main Question:
        - "What operational factors influence the delivery and acceptance of these interventions?"
    - Probes:
        - "Are there challenges with supply chain, infrastructure, or staff availability?"
        - "How do you handle delays or shortages of supplies?"
3. Geographical and Contextual Challenges:
    - Main Question:
        - "Does the geography or location of your center affect the implementation of these interventions?"
    - Probes:
        - "Are there specific challenges in remote or underserved areas?"

        - "How do weather or transport issues impact your work?"
1. Beneficiary Attitudes and Perceptions:
    - Main Question:
        - "How do the attitudes and perceptions of families and children affect the acceptance of these interventions?"
    - Probes:
        - "Are there misconceptions or lack of awareness about these programs?"
        - "Do families trust the quality and benefits of the interventions?"

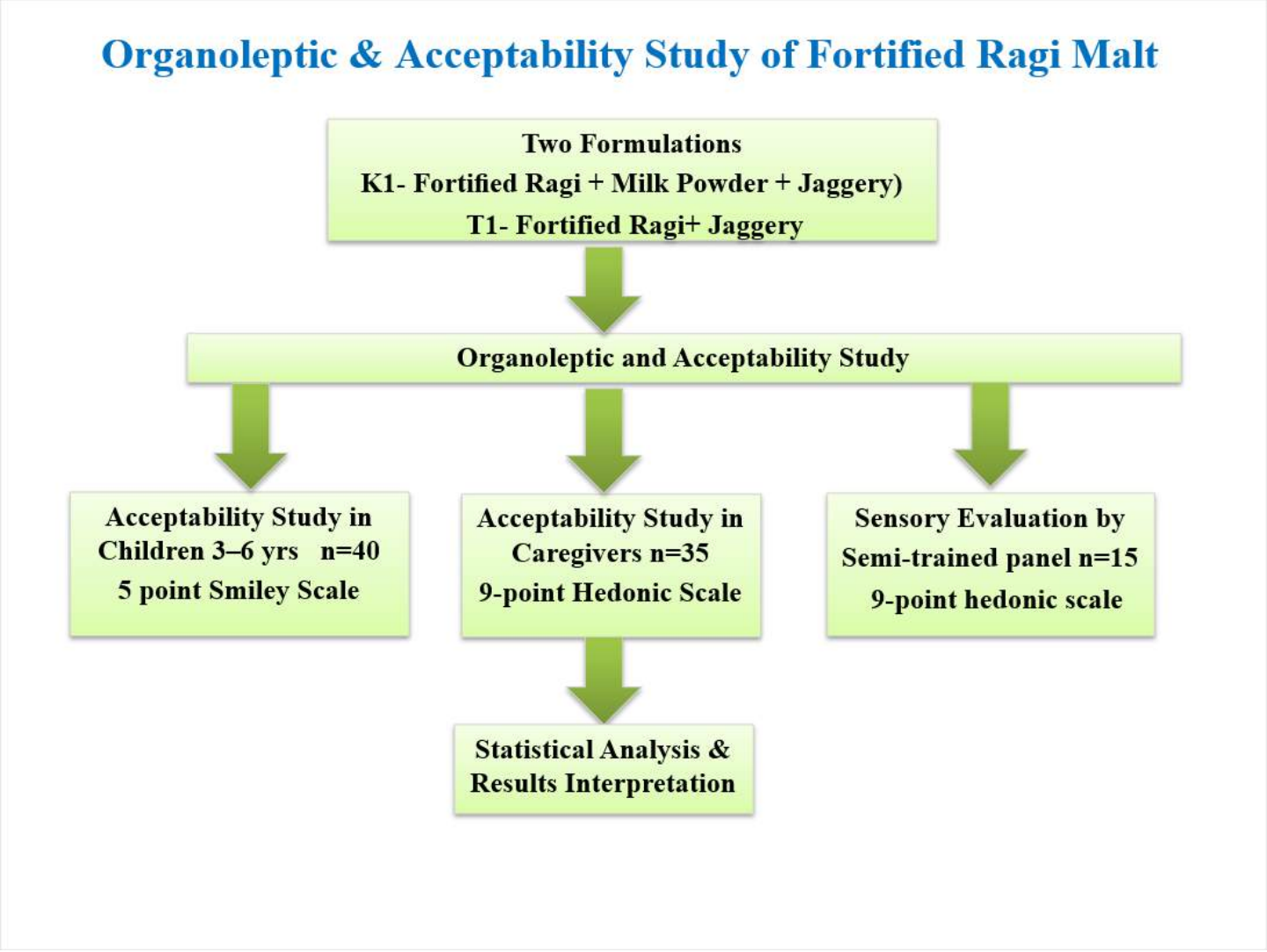
Section 5: Challenges and Recommendations

1. Challenges in Delivery:
    - Main Question:
        - "What are the biggest challenges you face in delivering these interventions?"
    - Probes:
        - "Do you feel you have enough training and resources to perform your role effectively?"
        - "Are there challenges in engaging with families or children?"
2. Suggestions for Improvement:
    - Main Question:
        - "What recommendations would you make to improve the implementation and acceptance of these interventions?"
    - Probes:
        - "Do you think additional training, resources, or infrastructure would help?"
        - "How can the involvement of stakeholders, such as CDPOs or block officers, be improved?"

Conclusion

1. Final Thoughts:
    - "Is there anything else you would like to share about your experiences with these nutritional interventions?"
2. Thank the Participant:
    - Thank the Anganwadi Worker for their time and valuable insights.

Annexure: Organoleptic and Acceptability Study of Fortified Ragi Malt



Annexure. Acceptability study data collection form for children (Smiley Scale)

Acceptability / Trial feeding Form

Child's Information

- Child's Name/ID: _____
- Age: ___ years
- Date of Evaluation: ___ / ___ / 2025
- Evaluator's Name: _____

Please (✓) tick the appropriate option

Sensory Attribute	Loved it! (5)	Liked it (4)	Neutral (3)	Didn't like much (2)	Disliked (1)	Remarks (Optional)
Appearance (Looks good?)						_____
Colour (Attractive color?)						_____
Taste (Yummy or not?)						_____
Flavour (Pleasant flavor?)						_____
Texture (Feels good in the mouth?)						_____
Aroma (Smells nice?)						_____
Overall Palatability (Would you eat it again?)						_____

Observations (Evaluator's Notes):

_____

Annexure. Acceptability study data collection form for children

Test-Meal Feeding Trial Study

Project title: Exploring the Implementation, Delivery, and Utilization of Various Interventions through ICDS and Schools Across Telangana and Karnataka: A Mixed Method Study

Date: __/__/__

a) Anganwadi Centre Name: _____
b) Recipe Code: ___
c) Name of the Recipe: _____
d) Product Code: ___

S.No.	Name of the subject	Gender	Age (Yrs)	Weight (Kg)	Meal time	Serving size (g)	Leftover (g)	Consumption (%)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Annexure. Sensory Evaluation form for the Institutional Sensory Panel

Sensory Evaluation Form for the Institutional Sensory Panel

Project title: Exploring the Implementation, Delivery, and Utilization of Various Interventions through ICDS and Schools Across Telangana and Karnataka: A Mixed Method Study

1. Participant ID: _ _ _ _ 2. Name of the Division: _____

3. Age (Years): _ _ 4. Gender (1. Male 2. Female): _____

5. Date of evaluation (dd/mm/yy): _ _/_ _/_ _ 6. Recipe Code: _____

7. Start Time (hh/mm): _ _ / _ _ 8. End Time (hh/mm): _ _ / _ _

The Dietary Supplementation of Fortified Ragi mix is proposed for children through ICDS in the age group of 3-6 years to satisfy the nutritional requirements. Please assess the sensory properties of the foods form left to right only, and give appropriate scores. Also, give suggestions if any, for improvement.

SI NO	Sensory Attribute	Food Product Code _ _ _	Food Product Code _ _ _	Comments / Suggestions
01	Appearance			
02	Colour			
03	Aroma			
04	Texture/Consistency			
05	Taste			
06	Flavour			
07	Overall Acceptability			

Score: 9) Like extremely; 8) Like very much; 7) Like moderately; 6) Like slightly; 5) Neither like nor dislike; 4) Dislike Slightly; 3) Dislike moderately; 2) Dislike very much and 1) Dislike extremely

Annexure. Structured Questionnaire: Dietary Patterns and Constraints in Millet Utilization

Section 1: Household Information

1. Demographics:
   - Name of respondent: _____
   - Age: _____
   - Gender: _____
   - Number of household members: _____
   - Occupation of head of household: _____
2. Location Details:
   - Village/Ward: _____
   - District: _____
   - State: _____

Section 2: Dietary Patterns

1. Millet Consumption Frequency:
   - How often does your household consume millets?
     -
2. Types of Millets Consumed:
   - Which types of millets do you consume?
     -
3. Common Preparations:
   - What are the common dishes prepared using millets?
     -
4. Sources of Millets:
   - Where do you typically source millets for household consumption?
     -

Section 3: Constraints in Millet Utilization

1. Barriers to Consumption:
   - What are the main reasons for not consuming millets more frequently?
     -
2. Perceived Benefits and Drawbacks:
   - Do you think millets are healthier compared to other grains (e.g., rice, wheat)?
     -
3. Awareness of Nutritional Benefits:
   - Are you aware of the nutritional benefits of millets (e.g., rich in fiber, calcium)?
     -
4. Support for Millet Consumption:
   - What support would encourage your household to consume more millets?
     -

Section 4: Recommendations

1. Improvement Suggestions:
   - What would you suggest to make millets more accessible and acceptable in your community?
2. Additional Comments:
   - Is there anything else you would like to share about millet consumption or its challenges?

Thank You Note

- "Thank you for participating in this survey. Your responses will help us understand millet consumption patterns and how we can address the challenges better."

Table. Commonly consumed Millets FFQ (Food Frequency Questionnaire)

S. No	Millet name	Daily	Weekly	Monthly	Occasionally	Never	Other remarks
1	Jowar (Jonanlu)						
2	Finger millet (Ragi)						
3	Pearl millet/ bajra (sajjalu)						
4	Little millet (saamalu)						
5	Foxtail millet (korralu)						
6	Kodo millet (Arikelu)						
7	Proso millet (Variagalu)						
8	Barnyard millet (oodalu)						
9	Others (Mention name)						

Nutritional Interventions for Children, Pregnant Women, and Lactating Mothers in Telangana and Karnataka

Nutritional interventions in Telangana

The Supervised Supplementary Feeding Program (SSFP)
The Supervised Supplementary Feeding Program (SSFP) is a community-based intervention developed by the Department of Women Development & Child Welfare, Telangana, with support from UNICEF, ICMR-NIN, and others, to combat under nutrition, especially wasting among children aged 6 to 59 months. It targets children suffering from Moderate Acute Malnutrition (MAM) and Severe Acute Malnutrition (SAM) without medical complications, aiming to prevent deterioration, improve nutritional status, and support long-term child well-being.

Key components of the program include the provision of nutritional support through a specially formulated food, Balamrutham-Plus, which is richer in energy, protein, and micronutrients compared to the standard Balamrutham. Caregivers are also guided in preparing energy-dense, home-based foods. Children are medically assessed for complications, with referrals to Nutrition Rehabilitation Centers (NRCs) if necessary. Growth monitoring is conducted regularly to track weight and height, ensuring timely and appropriate care.
The SSFP is implemented through Anganwadi Centres (AWCs), involving Anganwadi Teachers (AWTs) and Auxiliary Nurse Midwives (ANMs). The program also delivers health and nutrition education to caregivers, covering optimal feeding practices, hygiene, sanitation, immunization, and related health topics. Follow-up is ensured even after a child's discharge from the program to maintain long-term improvement.
Early pilot studies demonstrated positive outcomes, showing improvements in the nutritional status of children enrolled in the program, even amidst the disruptions caused by the COVID-19 pandemic. The use of locally produced, culturally appropriate foods enhances both the sustainability and community acceptance of the intervention.

In summary, SSFP represents a vital advancement in the community-based management of acute malnutrition, offering a replicable, cost-effective model for addressing MAM and SAM in resource-limited settings and strengthening overall child nutrition systems in Telangana.

The Telangana Nutrition Mission
The Telangana Nutrition Mission is a comprehensive, multi-sectoral initiative aimed at combating malnutrition and improving the nutritional status of vulnerable populations—especially children, pregnant women, and lactating mothers. Implemented in collaboration with government departments and civil society organizations, the Mission integrates multiple ongoing schemes to deliver targeted, impactful nutrition services.

Key interventions include the Arogya Lakshmi Scheme, which provides full meals, milk, eggs, and IFA tablets to pregnant and lactating women at Anganwadi Centres. The Amma vodi Scheme distributes essential nutrition kits, while the PM Poshan (Poshan Shakti Nirman) Scheme ensures school children (Classes 1-10) receive mid-day meals and morning fortified drinks like Ragi Java. Collaboration with Sri Sathya Sai Annapoorna Trust further supports the provision of SaiSure Ragi with milk for schoolchildren in other states like Karnataka.

The Telangana Nutrition Mission targets three primary groups:

- Pregnant and lactating women, with a focus on reducing anemia, low birth weight, and maternal and infant mortality.
- Children aged 0-6 years, through Balamrutham, eggs, and health check-ups at Anganwadis;
- School children, by improving nutrition to support academic performance.

A special focus is placed on millets, such as ragi, due to their high nutritional value, particularly in districts like Vikarabad and Adilabad. Malnourished children identified with SAM or MAM receive supervised supplementary feeding through Anganwadi Centres.

The Mission also emphasizes community engagement through initiatives like Poshan Maah and Poshan Pakhwada, promoting awareness of maternal health and child feeding practices. Technology is leveraged via the Poshan Tracker for real-time service delivery monitoring, while frontline workers are empowered through CMAM protocols for early identification and referral. Despite these efforts, challenges such as high stunting rates and urban-rural disparities remain. Moving forward, the Telangana Nutrition Mission aims to strengthen interventions, enhance dietary diversity, and promote community ownership to build a healthier, nutrition-secure future.

The state of Telangana implements a range of targeted nutrition interventions under the Integrated Child Development Services (ICDS) to address undernutrition among children under six years of age. These programs are structured based on age and nutritional status and primarily include Take Home Ration (THR) and on-site feeding through Anganwadi centers. For children aged 6 to 36 months who are considered nutritionally normal, the THR includes 2.5 kg of Balamrutham per month along with 16 eggs, providing an average of 500 kcal and 12–15 grams of protein per day. For children in the same age group identified as suffering from Severe Acute Malnutrition (SAM) or Moderate Acute Malnutrition (MAM), a more intensive ration known as Balamrutham Plus is provided. This includes one kilogram of a fortified mix, extra oil, and 16 eggs, offering approximately 800 kcal and 20–25 grams of protein daily.

Children aged 3 to 6 years receive mid-morning meals at Anganwadi centers, which include a boiled egg and mini meals, delivering about 548 kcal and 18.7 grams of protein per day. These meals are scheduled at 10:30 a.m., ensuring energy intake during active morning hours. The programs aim to deliver both macro- and micronutrient-rich foods using culturally acceptable ingredients. Weekly menus are also developed to ensure dietary diversity and palatability. These initiatives reflect the state's effort to provide age-specific, nutrition-dense interventions using locally sourced, cost-effective food models to address malnutrition at the community level.

Table. Current Nutrition Interventions in Telangana

Type of Programme	Description of Programme			Nutritive value	Total	Detailed Menu
	Frequency & Timings	Foods	Quantity of Food			
Take Home Ration	Per month Balamarutham-2.5 kg packet (1 Packet)	Balamarutham +Eggs	Balamarutham- 2.5 kg per month Eggs -16 eggs for month	Balamarutham calories - 414 Protein - 11 grams Calcium	Calories - 500 Kcal Protein - 12-15 grams	
Take Home Ration	Balamarutham Plus 1kg packet (According to weight) Per month	Balamarutham plus + Eggs + Extra oil	Balamarutham Plus 1kg packet (According to weight Eggs - 30 eggs for month	Balamarutham Plus calories - 460 Protein - 11 Calcium - 419	Calories - 800 Kcal Protein - 20-25 grams	
Mini meal/ Spot feeding at Anganwadi	Mid-Morning (10.30 am)	Boiled Egg	Egg - 50grams	Calories - 86.5 Kcal Protein - 6.65 grams	Calories - 548.73 kcal Protein- 18.68	Menu for a Week Monday - Rice + Veg sambar + Egg + Tuesday - Rice + GLV Dal + Egg Wednesday - Rice+ Veg curry + Egg Thursday - Rice + Veg curry + sambar + Egg Friday - Rice + veg curry + Egg Saturday - Vegetable biryani + Egg
	Lunch - 12.15 to 1.00 pm	Rice + Dal+ Vegetables+ oil	Rice- 75 grams Red gram dal - 15 grams Vegetables - 25 grams Oil- 5 gram	Calories - 382 kcal Protein - 9.63 gm		
	Snack (3pm)	Telangana Food Nutri snacks	20 grams	Calories - 80 kcal Protein- 6.65 grams		
Mini meal/ Spot feeding at Anganwadi	Mid-Morning (10.30 am)	Boiled Egg	Egg - 50grams	Calories - 86.5 Kcal Protein - 6.65 grams	Calories - 800 Kcal Protein - 20-25 grams	Menu for a Week Monday - Rice + Veg sambar + Egg + Tuesday - Rice + GLV Dal + Egg Wednesday - Rice + Veg curry + Egg Thursday - Rice + Veg curry + sambar + Egg Friday - Rice + veg curry + Egg Saturday - Vegetable biryani + Egg
	Mini meal/ Spot feeding at Anganwadi (12.30 pm)	Rice + Dal+ Vegetables+ oil	Rice- 75 grams Red gram dal - 15 grams Vegetables - 25 grams Oil- 5 gram	Calories - 382 kcal Protein - 9.63 gm		
	Snack (3pm)	Telangana Food Nutri snacks	20 grams	Calories - 80 kcal Protein- 6.65 grams		
	4:00 PM	Balamarutham Plus	50 grams	Calories - 230 Kcal Protein - 5.5 grams Calcium - 209.5		
Take Home Ration	Morning Time (7.30 am)	Balamarutham plus (1kg packet)	Balamarutham Plus (According to weight)	Balamarutham Plus Calories - 460 kcal Protein - 11 grams Calcium - 419		

Mini meal/ Spot feeding at Anganwadi	12.15 to 1 .00 PM	Rice + Dal + Vegetables + egg + milk	Rice- 150 grams Red gram dal - 30 grams Vegetables - 50 grams Oil- 16 gram Milk- 200 ml Egg- 50 grams		Calories - 1192.38 kcal Protein- 37.04 Calcium - 578.56	Menu for a Week Monday- Rice + Veg sambar + Egg + milk Tuesday - Rice+ dal + GLV curry + milk+ egg Wednesday - Rice+ Dal + GLV curry +Curd+ Milk + Egg Thursday- Rice + Veg sambar+ Egg + milk Friday - Rice+ dal + GLV curry + milk+ egg Saturday - Rice + GLV dal+ Curd + milk + Egg
Ragi malt	10.30- 11 am (On Tuesday, Thursday, Saturday)	Fortified ragi malt	200 ml	Calories - 72 Kcal Protein- 0.77 grams Calcium- 42.4 g	Class I to V Calories - 450 Protein- 12 g	Detailed menu for a week Monday- Khichdi + mix veg curry + Egg Tuesday - Ragi malt + Rice + sambar + mixed veg curry Wednesday - Rice+ GLV dal + Mixed veg curry + Egg Thursday- Ragi malt+ veg biryani+ mix veg curry Friday - Rice + sambar + mix veg curry + egg Saturday - ragi malt + rice + GLV dal + mix veg curry
MDM - Hot cooked Meals in Bhuvanagiri & Akshayapatra in Mahaboob nagar)	12 to 1pm Hot cooked meals + Egg (on Monday, Wednesday, Friday)	Rice + Dal + Vegetables + oil	Rice- 75 grams Red gram dal - 15 grams Vegetables - 25 grams Oil- 5 gram	Calories - 382 kcal Protein - 9.63 gm	Class VI to VIII Calories - 700 Protein- 20 g	

Nutritional interventions in Karnataka

Integrated Child Development Services (ICDS)

The Integrated Child Development Services (ICDS) Scheme in Karnataka is a cornerstone public health and nutrition initiative aimed at addressing the nutritional, health, and developmental needs of young children (0–6 years), pregnant and lactating women, and adolescent girls. Launched on 2nd October 1975 as a pilot in T. Narasipura of Mysore district with just 100 Anganwadi Centres (AWCs), the programme has since expanded to cover all revenue taluks in the state. The ICDS reflects the state's commitment to the belief that the health and well-being of its children determines the future of the nation. With a lifecycle approach, it integrates nutrition, health, and early education through community-based platforms.

The key objectives of the ICDS scheme are to improve the nutritional and health status of children under six years, reduce child mortality, morbidity, malnutrition, and school dropouts, and lay the foundation for proper psychological, physical, and emotional development. It also aims to empower mothers through nutrition and health education, enhancing their capacity to care for their children. The programme ensures interdepartmental coordination between health, education, and rural development to effectively deliver services.

Supplementary Nutrition Programme (SNP)

The Supplementary Nutrition Programme (SNP) is one of the central components of ICDS. Under this, children aged 6 months to 6 years receive supplementary food for 300 days in a year to bridge the dietary gap. As per revised norms, normal children are provided with 500 kcal and 12–15 grams of protein, while severely malnourished children (SAM) receive 800 kcal and 20–25 grams of protein. Pregnant and lactating women, as well as adolescent girls, receive 600 kcal and 18–20 grams of protein per day. The unit cost per beneficiary per day is ₹8 for normal children, ₹12 for SAM children, and ₹9.50 for pregnant and lactating women.

Children aged 6 months to 3 years are provided Take Home Ration (THR) in the form of 'Pushti', which includes roasted wheat, roasted gram, soybean flour, edible oil, jaggery, and fortified vitamins and minerals. This mix provides balanced macro- and micronutrients to support early growth. For children aged 3–6 years, spot feeding (hot cooked meals) is provided at Anganwadi Centres. These meals typically consist of a breakfast such as millet or sweet laddu, and a mid-day meal like anna sambar, rava payasa, or uppittu (upma). These dishes are made with regionally available ingredients and are designed to meet the recommended dietary allowances.

The Mathrupoorna Scheme

The Mathrupoorna Scheme, operational under ICDS, focuses on the nutritional needs of pregnant and lactating women by providing one hot cooked meal daily at the Anganwadi centre. The meal includes rice, sambar, egg, 150 ml of milk, and a sweet preparation like payasa or upma. Women are also encouraged to consume iron-folic acid tablets on the spot, addressing widespread anemia. In geographically remote and hilly

hilly districts such as Udupi, Shivamogga, and Kodagu, the scheme adapts by distributing raw food kits to be cooked at home.

Karnataka has also introduced special interventions like the Srushti Scheme to improve the nutritional status of children through egg supplementation. Children aged 3 to 6 years receive two eggs per week, while SAM/MAM children aged 6 months to 3 years receive three eggs per week, and those aged 3 to 6 years receive five eggs per week. For children who do not consume eggs, milk is provided six days a week as an alternative protein source. The Ksheera Bhagya Scheme supplements this by offering 150 ml of creamy milk (made with 15 g of milk powder and 10 g of sugar) to Anganwadi children for five days a week, enhancing protein and calcium intake.

The Pushti Nutrition Kit Scheme is another innovation targeting newly married and pregnant women in 102 aspirational taluks. The kit contains 1 kg each of jaggery, moong dal, millet laddu, and salt, 0.5 kg each of toor dal and oil, providing an extra layer of food security and nutritional support during critical periods.

PM Poshan (Poshan Shakti Nirman) Scheme / Mid-Day Meal (MDM) Programme

For school-aged children, the Mid-Day Meal (MDM) Programme is implemented across government and aided schools. It provides 450 kcal and 12 grams of protein for primary students (Classes I-V) and 700 kcal and 20 grams of protein for upper primary students (Classes VI–VIII). Meals are prepared using 100-150 g rice/flour, 20-30 g pulses, 50-75 g vegetables, and 5-7.5 g oil, based on age group. The weekly menu includes rice sambar with various vegetables, bisibelebath (a spicy rice-lentil dish), and wheat-based preparations on Saturdays. Locally available vegetables are used, and food quality is maintained using iodized salt and certified ingredients. Additionally, Vitamin A and WIFS (Weekly Iron and Folic Acid Supplementation) tablets are distributed to students from Classes I to X under NRHM to address micronutrient deficiencies, particularly anemia.

Along with Mid-Day Meals the Sai Sure Ragi Malt initiative in Karnataka provides a fortified millet-based health drink to over 53 lakh government schoolchildren. Initially served thrice a week, it was expanded in March 2025 to five days weekly under the Mid-Day Meal Scheme. Developed by the Sri Sathya Sai Annapoorna Trust, the malt is rich in calcium, iron, and micronutrients, supporting growth and learning. It exemplifies an effective public-private partnership to enhance school nutrition and combat child malnutrition.

In conclusion, the ICDS Scheme in Karnataka is a comprehensive, integrated, and regionally adapted model of nutrition delivery. By combining THR, cooked meals, egg and milk supplementation, and health education, it addresses the multifaceted causes of malnutrition and supports child and maternal well-being. The scheme demonstrates strong policy implementation, interdepartmental coordination, and sensitivity to local food cultures, making it a critical tool for advancing nutrition and development outcomes in the state.

Table. Current Nutrition Interventions in Karnataka

Name of the Programme	Age	Type of Programme	Description of Programme			Nutritive value	Total	Detailed Menu
			Frequency & Timings	Foods	Quantity of Food			
ICDS (Integrated Child Development Services)	**6-36 months (Normal Children)**	Take Home Ration		Pushti Powder (2.5 Kgs) + Jaggery (1 Kg) per month	Pushti Powder (2.5 Kgs) + Jaggery (1 Kg) per month	Pushti Powder Calories - 346.8 kcal Protein - 11.3 grams Jaggery Calories - 383 kcal Protein- 0.4 g	Calories - 730 Kcal Protein - 12 grams	
SNP (Supplementary nutrition Programme)	**6-36 months (SAM/ MAM Children)**	Take Home Ration		Pushti Powder (4 Kgs)+Jaggery (1 Kg) Per month + Eggs	Pushti Powder- (4 Kgs) + Jaggery (1.5 Kg) Per month + 12 eggs per month	Pushti Powder calories - 346.8, Protein - 11.3grams, Jaggery Calories- 383 kcal, protein- 0.4 g, Eggs Calories- 173, protein- 13.3	Calories - 902.8 Kcal Protein - 25 grams	

Name of the Programme	Age	Type of Programme	Description of Programme			Nutritive value	Total	Detailed Menu
			Frequency & Timings	Foods	Quantity of Food			
ICDS (Integrated Child Development Services) SNP (Supplementary nutrition Programme)	**3-6 yrs Normal children**	Mini meal/ Spot feeding at Anganwadi		Pushti Powder (2.5 Kgs) + Jaggery (1 Kg) per month	Pushti Powder (2.5 Kgs) + Jaggery (1 Kg) per month	Pushti Powder Calories - 346.8 kcal Protein - 11.3 grams Jaggery Calories - 383 kcal Protein- 0.4 g	Calories - 730 Kcal Protein - 12 grams	
	6-36 months (SAM/ MAM Children)	Take Home Ration	Morning Time (9 am)	Milk 150 ml	Milk 150 ml	Pushti Powder calories - 346.8, Protein - 11.3grams, Jaggery Calories- 383 kcal, protein- 0.4 g, Eggs Calories- 173, protein- 13.3	Calories - 902.8 Kcal Protein - 25 grams	**Menu for a Week** **Monday** - Rice + Veg sambar **Tuesday** - Broken wheat Upma + Egg **Wednesday** - Rice+ Veg Sambar **Thursday**- Broken wheat Upma + Egg **Friday** - Rice+ veg curry **Saturday** - Rava Payasam
			Mid Morning (10.30 am)	Sweet pushti or millet laddu	Sweet pushti or millet laddu (40gms)	Pushti Powder calories - 346.8, Protein - 11.3grams, Jaggery Calories- 383 kcal, protein- 0.4 g, Eggs Calories- 173, protein- 13.3	Calories - 902.8 Kcal Protein - 25 grams	
			Lunch - 12.15 to 1.00 pm	Anna sambar or Rava Payasa or Upma + Egg (5 days a week)	Sweet pushti or millet laddu (40gms)	Rice – 64.71g Toor Dhal – 9g Salt – 2.7g Oil – 1.8g Sambar Masala – 11.79g	Calories - 902.8 Kcal Protein - 25 grams	
	3yrs - 6yr SAM/ MAM children	Mini meal/ Spot feeding at Anganwadi or THR	Morning Time (9 am)	Milk 150 ml	Milk 150 ml			**Menu for a Week** **Monday** - Rice + Veg sambar **Tuesday** - Broken wheat Upma + Egg **Wednesday** - Rice+ Veg Sambar **Thursday**- Broken wheat Upma + Egg **Friday** - Rice+ veg curry **Saturday** - Rava Payasam
			Mid Morning (10.30 am)	Sweet pushti or millet laddu	Sweet pushti or millet laddu (40gms)			
			Lunch - 12.15 to 1.00 pm	Anna sambar or Rava Payasa or Upma + Egg (2 days a week)	Rice and Sambhar ingredients (90 gms per serving) Rice - 68.305g Green gram - 9.5g Salt - 2.85g Oil - 1.9g Sambar Masala - 12.445g Upma Ingredients (90 gms per serving) Rice – 76.95g Soya Flour with premix – 5.7g Salt – 2.85g Oil – 4.75g Bengal gram - 2.85g Dry chilli – 0.95g Mustard – 0.95g Payasam Ingredients (90 gm per serving)- Rice - 60.8g Soya flour with Premix, card - 7.6g Bengal gram - 2.85g Jaggery - 23.75g			
	Pregnant and Lactating Mother (Mathrupoorna Scheme)	Take Home Ration	Take Home Ration	Anna sambar or Rava Payasa or Upma + Egg (1 per day)	Rice and Sambhar ingredients (90 gms per serving) Rice – 68.305g Green gram – 9.5g Salt – 2.85g Oil – 1.9g Sambar Masala – 12.445g Upma Ingredients (95 gms per serving)- Rice – 76.95g Soya Flour with premix – 5.7g Salt – 2.85g Oil – 4.75g Bengal gram – 2.85g Dry chilli – 0.95g Mustard – 0.95g Payasam Ingredients (95 gm per serving)- Rice– 60.8g Soya flour with Premix, card – 7.6g Bengal gram – 2.85g Jaggery – 23.75g			
Mid-Day Meal Programme (PM Poshan / Poshan Shakthi Scheme)	**School Children (6 to 14 years Age)**	Ragi malt	10.30- 11 am Everyday	Fortified ragi malt + Milk powder + Sugar	150ml			**Detailed menu for a week** **Monday** - Rice + GLV Sambar + Egg **Tuesday** - Rice + Other vegetables sambar + Egg **Wednesday** - Rice+ Drumstick and Onion Sambar + Egg **Thursday** - Rice + Pumpkin or Ladies finger Sambar + Egg **Friday** - Bisibelebath + egg **Saturday** - Vegetable Upma or Broken wheat payasam + Egg
		MDM - Hot cooked Meals	12 to 1pm Hot cooked meals + Eggs	Rice+ Sambar + Egg (Monday to Thursday), Bisibele bath or Upma on Friday and Sweet made of Wheat on Saturday	Rice- 100 grams Red gram dal - 30 grams Vegetables - 75 grams Oil - 7.5 grams Egg- 50 grams			

ICMR- National Institute of Nutrition

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Ministry of Health and Family Welfare, Government of India

Suggested Citation

Mahajan H, Parasannanwar D, R Venkateswarlu, Talari A, Varsha M, Lakshmi SB, Kumar PV. Exploring the Implementation, Delivery, and Utilization of Various Interventions Through ICDS and Schools Across Telangana and Karnataka: A Mixed Method Study; 2025.