A Newly Introduced Millet-based Take Home Ration: Utilization, Strength & Challenges in Ahmedabad Municipal Corporation, Gujarat

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Abstract:

Introduction: The Government of India is promoting millet-based nutrition through Integrated Child Development Services (ICDS) and POSHAN Abhiyaan. In December 2023, two ICDS blocks of Ahmedabad Municipal Corporation (AMC) implemented a pilot project to provide a millet-based Take Home Ration (THR). **Objectives:** 1. To evaluate the utilization and barriers in utilization of a millet-based Take Home Ration (THR) compared to the standard Take Home Ration (THR) among beneficiaries. 2. To identify strength and challenges in effective implementation of millet-based Take Home Ration (THR) **Methods:** A cross-sectional analytical study was conducted across 60 Anganwadi Centres (AWCs), with 30 each from millet-based THR and standard THR blocks. Using WHO cluster sampling and Probability Proportional to Size methodology, a total of 1,627 beneficiaries were surveyed—comprising children aged 6 months to 3 years (n_1=1178), pregnant women (n_2=220), and lactating mothers (n_3=229). Data were collected in April 2024, four months post-implementation, using a structured, pilot-tested questionnaire. **Results:** Utilization of millet-based THR was lower (n=749, 92%) compared to standard THR (n=773, 95%), with a significant gap among children (91.8% vs. 95.9%, p=0.003). However, the frequency of consumption per week (3.4±2.05 vs. 2.3±1.33 times, p<0.001) and monthly packet usage (5.05±1.9 vs. 4.5±2 packet, p<0.001) were significantly higher in the millet-based group. Barriers to utilization included disliking the taste (53%) and appearance (47%). Awareness of the change in THR composition was limited (53%), and recipe demonstrations were not conducted. **Conclusion:** Millet-based THR was well tolerated with no adverse effects. However, effective implementation requires improved taste, community sensitization and training of Anganwadi workers.

Keywords: Challenges, Comparative study, ICDS, Millets, Nutrition, Take Home Ration

Introduction:

The role of supplemental nutrition within the framework of Integrated Child Development Services (ICDS) has recently been re-emphasized by the National Nutrition Mission (NNM), also known as POSHAN Abhiyaan (Prime Ministers Overarching Scheme for Holistic Nourishment). In Gujarat, Take Home Ration (THR) includes fortified premixes, wheat and pulse-based energy foods (such as Bal Shakti for children, Matru Shakti for pregnant and lactating mothers and Purna Shakti for adolescent girls), as well as fortified milk, groundnut oil, and Satva (double-fortified salt with iron and iodine).[1]

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Millets are being incorporated into the THR system to improve the nutritional profile of the beneficiaries.[2] Millets are high in iron, which can help avoid anemia and is necessary for the synthesis of red blood cells, includes vitamin C as well, which enhance the absorption of iron. It has antioxidants, dietary fiber; it lowers intestinal inflammation, calms the digestive tract, and encourages regular bowel motions. Because they are naturally gluten-free, they are a fantastic substitute for wheat and other grains that contain gluten for those who have celiac disease or gluten intolerance. It lowers the risk of type 2 diabetes, enhances insulin sensitivity, and controls blood sugar levels. Lowers the risk of heart disease, controls blood pressure, and lowers cholesterol.[3] As per NITI Aayogs report on best practices in promoting millets in diets, a number of states including Madhya Pradesh, Chandigarh, Chhattisgarh, Odisha, Tamil Nadu, and Telangana have undertaken initiatives to include millets in ICDS.[4]

Ahmedabad Municipal Corporation (AMC), Gujarat has innovatively introduced millet-based THR in 2 ICDS blocks from December 2023. The millet-based THR replaces wheat with the millets. The pilot project aimed to broad base food basket, guarantee the availability of more nutrient-dense local food, and create a decentralized food model. No literature found regarding any community-based study on millet-based THR. Hence this study was designed to generate evidence on utilization with reasons for non-utilization of millet-based THR as compared to standard THR. Efforts are also made to identify strength and challenges in effective implementation of millet-based THR. This study is collaborative effort between ICDS department and Community Medicine department.

Methods:

Millet-based THR in Ahmedabad Municipal Corporation (AMC), Gujarat has been introduced since December 2023 in 2 ICDS blocks out of total 17 ICDS blocks on pilot bases.

Study Area and Study Population:

A cross-sectional analytical study was conducted which included 2 ICDS blocks of AMC where millet-based THR has been introduced (intervention group) and 2 adjacent blocks where standard THR was provided (non-intervention group). Anganwadi Centre (AWC) was considered as primary sampling unit from which study population comprised of 2 categories/strata of beneficiary: (1) children of 6 months to 3 years age and (2) pregnant women and lactating mothers were selected.

Sample Size and Sampling Technique:

A sample size of 726 beneficiaries per group (~25 beneficiaries per AWC) was calculated using the formula Z^2pq/l^2, with THR utilization rate among children of 35% in urban India[5] and an allowable error of 15%, multiplied by a design effect of 2 and adding 10% for stratification.

Study population was selected by applying Probability Proportional to Size sampling method. List of AWCs along with list of beneficiaries of selected 4 ICDS blocks were procured from ICDS department of AMC. The final sample size for the study was determined by considering the proportion of beneficiaries from each category (proportion of children=78% and proportion of pregnant and lactating mothers=22%), which included 19 children aged 6 months to 3 years & 6 pregnant women and lactating mothers from each AWCs. AWC having registered beneficiaries less than the required sample size from both strata were excluded from the list. After this, 30 AWCs from intervention group and 30 AWCs from non-intervention group were selected by applying WHO's cluster sampling method.[6] Thus, study population from total 60 AWCs were selected for the study.

The proforma and written guideline for field investigators (FIs) were developed by researchers, pilot-tested, and refined by faculty of Community Medicine department & Program Officers of ICDS department of

AMC. The proforma includes questions on demographic details, utilization of THR, awareness about changes in THR content, information about the advantages of millet-based THR, services provided by AWW (counselling about millet-based THR, advantages, recipe discussion/demonstration), suggestions on THR to increase utilization, etc. To identify strength, beneficiaries were asked about the frequency and regularity of THR related services. To identify challenges, reasons for non-utilization were asked. Although it was not our objective to identify opportunities and weaknesses in implementation, some opportunities and weaknesses of the program were perceived during the data collection while interacting with the community members. Mukhya Sevika from blocks other than the selected blocks were the FIs. Two days training program was conducted by researchers included study tool discussion, sensitization for importance of data and practical field training. All FIs were given field investigation booklet. Home visits of selected beneficiaries were carried out by trained FIs. To maintain the quality of data collection, entire process of data collection was supervised by researchers.

Selection of Beneficiaries in the Field:

Once the AWC selected, the selection of beneficiaries done by conducting house to house visits in a single direction from the AWC and inquiring for children aged 6 months to 3 years, pregnant women and lactating mother. Field telly list was made for the overall counting of the particular AWCs beneficiaries. When there was more than one beneficiary in the single house, only one beneficiary was selected randomly. In some of the area, beneficiaries did not answer all questions of the questionnaire, thus additional beneficiaries were taken from same AWC. Resulted final sample size of 1627, out of which 814 in intervention group and 813 non-intervention group.

Data collection was done in April 2024, four months post-implementation of millet-based THR. Statistical analysis included normality testing using the Kolmogorov-Smirnov test, Chi-square test for qualitative data, unpaired t-test for quantitative data, and proportion of utilization and number of packets used per month were analysed as the indicators.

Results:

A total of 1627 participants were included in this study, out of which 814 in millet-based THR group and 813 in standard THR group. The study participants are shown in Table1.

As shown in Table 2, there was similar utilization rate in millet-based THR and standard THR in the pregnant women and lactating mother categories whereas significantly lower rate of utilization (92%) in children of 6 months to 3 years age in the millet-based THR as compared to standard THR (96%). Two-third of the study population were children. The pooled utilization was significantly higher in the standard THR group (95%) compared to the millet-based THR group (92%).

Table 1: Distribution of beneficiaries by category in Millet-based and Standard THR groups

Category	Millet-based THR	Standard THR
6 months - 3 years children	584 (71.7%)	594 (73.1%)
Pregnant women	114 (14%)	106 (13%)
Lactating mothers	116 (14.3%)	113 (13.9%)
Total	814 (100%)	813 (100%)

Table 2: Comparison of utilization of Millet-based and Standard THR among ICDS beneficiaries

Beneficiaries	Utilizing Millet-based THR	Utilizing Standard THR	p-value*
6 months - 3 years children	536 (91.8%)	570 (95.9%)	0.003
Pregnant women	107 (93.9%)	97 (91.5%)	0.5
Lactating mothers	106 (91.4%)	106 (93.8%)	0.6
Total	749 (92%)	773 (95%)	0.01

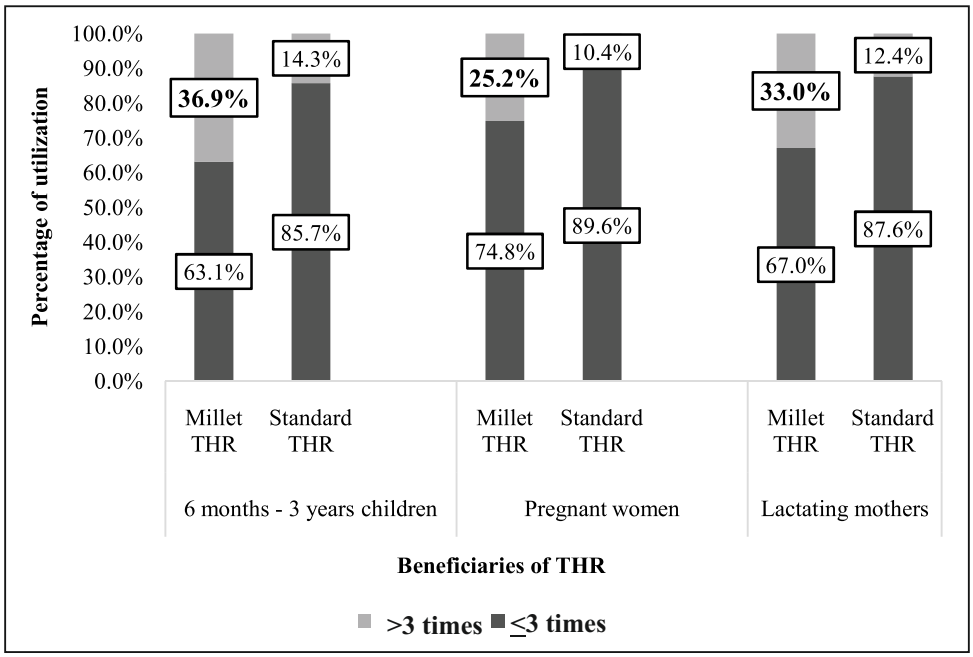
*Chi square test, df=1

Table 3:Comparison of frequency and quantity of THR utilization among Millet-based and Standard THR among ICDS beneficiaries

Utilization	Millet-based THR (n=749)	Standard THR (n=773)	p-value*
Frequency of THR meal in last week	3.4 ± 2.05 times/week	2.3 ± 1.33 times/week	<0.001
No. of THR packets used in previous month	5.05 ± 1.9 packets	4.5 ± 2 packets	<0.001

*Unpaired t-test

Figure 1: Distribution of beneficiaries by weekly frequency of THR utilization for millet-based and standard THR



All beneficiaries were asked about number of packets consumed during previous months and the frequency of consumption of THR meal in last week. As shown in Table 3 and Figure 1, beneficiaries in the millet-based THR group reported significantly higher frequency of THR meal consumption in the previous week (3.4 ± 2.05 times/week) compared to the standard THR group (2.3 ± 1.33 times/week). Additionally, the number of THR packets used in the previous month was also significantly higher in the millet-based THR group (5.05 ± 1.9 packets) compared to the standard THR group (4.5 ± 2 packets).

Figure 2: Reason for non-utilizing THR among beneficiaries of both groups

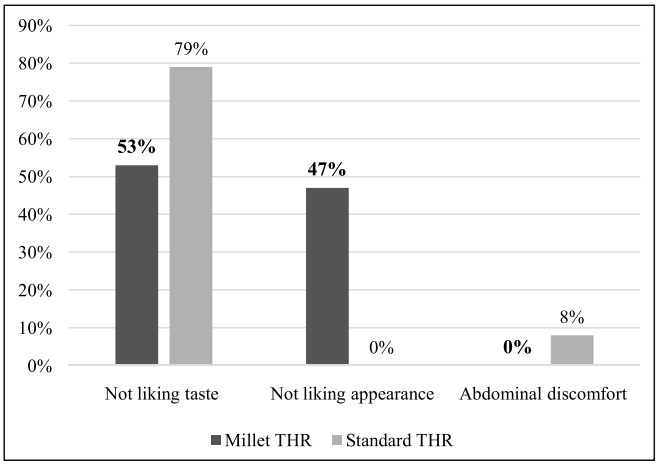


Figure 3: Overall rating of Millet-based THR by beneficiaries (n=749)

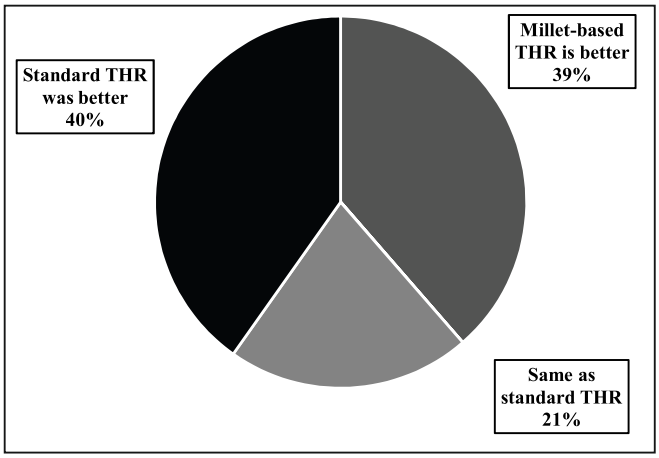


Figure 2 shows reason for non-utilizing THR. Out of total beneficiaries, 65 beneficiaries from millet-based THR group and 40 beneficiaries from standard THR group were not utilizing THR.

Figure 3 represents the overall rating given by beneficiaries utilizing millet-based THR. Around 60% of beneficiaries found millet-based THR better or same as standard THR.

Only 53% beneficiaries knew that standard THR was replaced by millet-based THR. Lack of knowledge about the content (47%) could potentially impact compliance and effective utilization of the THR.

Majority of the beneficiaries (98% from millet-based THR & 95% from standard THR) found cooking method of THR easy. None of the beneficiaries were shown any recipe manual by Anganwadi worker.

Suggestion for Millet-based THR by beneficiary

In this study, 74.6% of respondents expressed a preference for millet rations over individual THR packets. Around 14.9% of respondents suggested enhancing the taste of millet-based THR, while 8.6% of respondents proposed providing previous THR formulations alongside millet-based THR to facilitate adaptation. Only 1.9% suggested for offering both millet-based THR and standard THR options, allowing beneficiaries to choose based on their preferences.

Discussion:

The study compares utilization of a newly introduced millet-based THR with the regular THR among ICDS beneficiaries in a megacity of Gujarat. The overall utilization rate of millet-based THR (92%) was significantly lower than that of the standard THR (95%). The study from Sisodiya A et al[7] and Sabat S et al[8] showed 66% and 78.3% utilization of standard THR respectively. This finding suggests that among children, acceptance of millet-based THR was comparatively lower than the standard THR. This observation warrants further exploration into the factors influencing acceptance of the millet-based formulation, such as taste and appearance. In contrast, the utilization rates among pregnant women and lactating mothers were comparable between the two groups.

However, despite the lower overall utilization rate, the frequency and quantity of THR consumption differed significantly between the two groups. Table 3 and Figure 1 indicate that while the initial utilization rate of millet-based THR might be lower, those who utilized it, consumed it more frequently and in greater quantities. This could imply a potentially higher level of satisfaction or adherence among consistent utilizers of the millet-based THR group.

The reasons for non-utilization of millet-based THR were primarily attributed to disliking the taste (53%) and appearance (47%) as shown in Figure 2. Although the number of non-utilizers due to taste was lower in the millet-based THR group compared to the standard THR group, this difference was not statistically significant. The study from Sabat S et al[8] and Harikrishna BN et al[9] also shows 53.8% and 38.9% beneficiaries not liking taste of standard THR respectively. Appearance of millet-based THR recipes (dark coloured) seems to be major concern for utilization, efforts to sensitize beneficiaries to adopt the color of millet-based THR could potentially increase utilization. Notably, no beneficiaries in the millet-based THR group reported any

side effects, whereas 8% of standard THR non-utilizers discontinued use due to abdominal discomfort. This observation aligns with the digestive benefits of millets. The naturally rich in dietary fiber, resistant starch, alkaline and gluten-free millets prevent constipation, reduce bloating, reduce acidity and improve overall digestion.

Furthermore, the study revealed that only 53% of beneficiaries were aware of the replacement of standard THR with millet-based THR, and 47% lacked knowledge about its content. This lack of awareness could significantly hinder compliance and effective utilization. If beneficiaries don't understand the nutritional benefits or the recommended usage, they might be less likely to consume it consistently. Educational interventions should focus on explaining the ingredients, nutritional value and purpose of the millet-based THR. The lack of knowledge could also lead to misconceptions or misinformation about the millet-based THR, which could negatively impact its acceptance and utilization. Majority of the beneficiaries (98% for millet-based THR and 95% for standard THR) rated cooking THR was easy. However, none of the beneficiaries reported receiving recipe manuals from Anganwadi workers, highlighting a potential gap in the dissemination of information and practical guidance.

Strengths

- Introduced in settled system
- Well tolerated by users
- Innovative shift towards using locally sourced, nutrient-rich foods
- Efficient logistics and supply chain

Weaknesses

- Lack of differentiation in packaging
- Lack of awareness of replacement of THR
- Training aspect of AWWs & beneficiaries not taken care of
- Inadequate sensitization of beneficiaries regarding the benefit of millet

Opportunities

- Capacity building & sensitization workshops
- Experience sharing of different recipes from THR by beneficiary
- Targeted intervention for non-utilization
- Scaling up of millet-based interventions

Challenges

- Taste preferences
- Migrant population until universal implementation
- Lack of willingness of AWW to teach by demonstration

Limitations:

Information is based on respondent's point of view only, which may have recall bias.

Conclusion:

The introduction of millet-based Take Home Ration (THR) showed promising results in terms of meal frequency and packet utilization compared to standard THR. However, overall utilization was slightly lower, mainly due to taste preferences and visual appearance. The results indicate that millet-based THR is well accepted and no negative effects were noted, supports millet's potential advantages as a nutrient-dense substitute. No differentiation in packaging between millet-based THR and standard THR, lack of awareness regarding change in THR and sensitization of community regarding its advantage were identified as gap in effective utilization.

Recommendation:

The packaging for millet-based THR should be different than standard THR along with awareness regarding change and content of THR with its advantage. Acceptance can be increased by intervention like conducting cooking competition by using millet-based THR amongst underserved population of AWC and preparing recipe book. Various recipes sharing across the AWC/blocks.

Need to integrate training on interpersonal communication and counselling techniques into the AWW training curriculum to enhance their soft skills such as communication, time management, positivity, and teamwork. Improve implementation by good quality supervision and monitoring of communication & counseling activity of AWW.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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