International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Systematic Analysis of Complementary Feeding Practices Among Infants Aged 6-23 Months in India: Current Scenario its Determinants and Policy Interventions

Sonalpreet kaur[1], Dr. Nanthini Subbiah[2]

[1]Masters in Applied Nutrition, Extension and Training, Hyderabad
[2]Community Health Administration, NIHFW, New Delhi

Abstract

Background: Complementary feeding practices are crucial for the growth and development of children aged 6–23 months. Despite their importance, these practices remain suboptimal in India, contributing significantly to malnutrition. Key indicators such as Minimum Dietary Diversity (MDD), Minimum Meal Frequency (MMF), and Minimum Acceptable Diet (MAD) highlight inadequacies, with disparities influenced by socioeconomic, geographic, and cultural factors. Government programs like the Integrated Child Development Services (ICDS) and Poshan Abhiyaan aim to address these issues, but implementation challenges persist.

Methods: This systematic review analyzed complementary feeding practices in India using data from national surveys (NFHS-5, CNNS) and peer-reviewed literature published between 2010 and 2024. A thematic synthesis method was utilized to assess barriers, determinants, and the effectiveness of national nutrition programs. Only studies focusing on Indian populations and published in English were included.

Results: The analysis revealed significant gaps in complementary feeding practices. Only 23% of children achieve MDD, 35.1% meet MMF, and 11% fulfill MAD criteria. Urban areas outperform rural regions, and maternal education and socioeconomic status strongly influence outcomes. ICDS and Poshan Abhiyaan have shown progress yet encounter challenges such as resource allocation disparities, insufficient training of Anganwadi workers, and low coverage of behavior change communication (BCC) initiatives.

Conclusion: This review emphasizes the need for region-specific and culturally sensitive interventions to address disparities in complementary feeding practices. Strengthening public health education, enhancing program coverage, and utilizing digital tools could improve dietary diversity, meal frequency, and overall nutritional outcomes for children in India. The findings offer important insights for policymakers and program implementers in combating malnutrition and promoting equitable child health outcomes.

Keywords: Complementary feeding, Minimum Dietary Diversity(MDD), Minimum Meal Frequency (MMF), Minimum Adequate Diet(MAD), Integrated Child Development Scheme (ICDS), Poshan Abhiyan

INTRODUCTION

Adequate nutrition in infancy is essential for growth, development, and long-term health. Exclusive breastfeeding for the first six months of life followed by continued breastfeeding along with the introduction of nutritionally adequate and safe complementary foods thereafter, is recommended by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF).The first two years of a child's life are a period of critical growth and development[1]. The "1000 days" refers to the pregnancy period of 9 months plus the initial two years of life, during which exclusive breastfeeding (during the first six months) and appropriate complementary food introduction on time (at six months) are vital to ensure adequate growth and development.[2] Complementary feeding, or gradual introduction of the outside foods in addition to breast milk, is a crucial stage in an infant's diet. Proper timing, quantity, and quality of complementary feeding are vital to satisfy growing infants' expanding energy and nutritional needs [1]. In addition to energy, complementary foods should also contribute essential macronutrients and micronutrients to avoid deficiencies. Suboptimal complementary feeding practices are correlated with greater risks of iron deficiency anemia, infectious diseases like diarrhea and pneumonia, and poor cognitive development [3,4]. After six months of age, complementary foods play a crucial role in providing iron and other essential nutrients needed for the production of hemoglobin. These foods account for approximately 95% of iron needs of children between 12–23 months. Complementary foods can become a risk factor if not provided at the optimal time, as it heightens the risk for iron deficiency anemia.Siimes et al. [5] found that infants exclusively breastfed for over six months without complementary foods had notably lower serum iron and ferritin levels compared to those who received complementary feeding.

Aware of the pivotal function played by complementary feeding, Indian national programs, namely the Integrated Child Development Services (ICDS) and the Poshan Abhiyaan (National Nutrition Mission), have played a critical role in remediating inappropriate practices. Launched in 1975, the ICDS program targets provision of supplementary nutrition, health education, and supervision services to six years of age and younger children and their mothers[6]. Poshan Abhiyaan, launched in 2018, seeks to decrease stunting, undernutrition, and anemia by encouraging improved complementary feeding practices through behavior change communication and multi-sectoral interventions[7]. These initiatives highlight the importance of harmonizing policy efforts with global recommendations to enhance infant and young child feeding (IYCF) practices.

Significance of the review

India has a heavy burden of undernutrition among children, exhibiting a high prevalence of stunting (35.5%), wasting (19.3%), and being underweight (32.1%) among children below five years of age.Suboptimal complementary feeding practices are recognized as important drivers of these nutritional problems, with irreversible impacts on physical and mental development [8]. Based on the most recent National Family Health Survey (NFHS-5), only 45.9% of infants in the 6–8 months age group have timely and sufficient complementary foods, indicating the imperative need for better feeding practices [8].

Despite extensive research on infant and young child feeding (IYCF) practices, there remains an absence of community-based studies assessing complementary feeding using WHO indicators in vulnerable contexts.

Methodology

A systematic review was performed to evaluate the complementary feeding practices in India through Google Scholar, Research gate, PubMed and government reports like NFHS-5, CNNS and UNICEF publications. The search terms used include: "Complementary feeding practices in India","Infant and Young Child Feeding India","Micronutrient deficiencies in Indian Infants","Barriers to complementary feeding","National Nutrition Programs".

Inclusion Criteria- English language articles published between 2010 to 2024,research papers,systematic reviews and national survey reports and studies among Indian Population

Exclusion Criteria- Studies dealing with breastfeeding alone and without complementary feeding data,research from non-Indian settings and articles without full-text access.

The data were analyzed through thematic synthesis to identify key factors affecting complementary feeding practices in India, such as barriers,implications of sub-optimal feeding practices and the effectiveness of national nutrition programs.

Current Scenario of Complementary Feeding in India

Complementary feeding marks a crucial phase in a child's growth and development, commencing when breast milk alone can no longer fulfill an infant's nutritional requirements.The adequacy of complementary feeding is measured using three key indicators: Minimum Meal Frequency (MMF), Minimum Dietary Diversity (MDD), and Minimum Acceptable Diet (MAD).

The National Family and Health Survey conducted during 2019-21 under the Ministry of Health and Family Welfare, Government of India offers detailed insights into complementary feeding practices across India. Similarly, the Comprehensive National Nutrition Survey (CNNS), 2016-18, offers additional data for understanding feeding patterns among children under five years. These surveys highlight variations in practices based on socioeconomic, regional, and rural-urban disparities.

Key Indicators of Complementary Feeding

- **Minimum Acceptable Diet (MAD):** Represents the percentage of children aged 6–23 months who receive a diet fulfilling both the minimum meal frequency and dietary diversity. For breastfed children, this includes those who meet both dietary diversity and meal frequency on the previous day. For non-breastfed children, it refers to those who receive at least two milk feedings, along with meeting the dietary diversity and meal frequency criteria.
- **Minimum Dietary Diversity (MDD):** Refers to the percentage of children aged 6–23 months consuming foods from at least five distinct food groups.
- **Minimum Meal Frequency (MMF):** Reflects the percentage of children aged 6–23 months receiving the recommended number of meals. For breastfed infants, the meal frequency criteria are met if solid, semi-solid, or soft foods are offered at least twice daily for 6–8-month-olds, and at least three times daily for 9–23-month-olds. Non-breastfed children meet the minimum meal frequency when they are given solid, semi-solid, or soft foods at least four times daily.[10]

Timely initiation of complementary feeding

According to the **National Family Health Survey (NFHS-5)**, only 49% of infants aged 6–8 months receive timely complementary foods.In comparison, the **Comprehensive National Nutrition Survey (CNNS)** reports a slightly higher percentage, with 53% of infants aged 6–8 months receiving timely

complementary foods. [8,10]

The variation between these two datasets might be attributed to differences in survey methodologies, timeframes, or sample populations. Nevertheless, both surveys unequivocally point to the vital need for targeted actions to promote timely complementary feeding practices across India.

National and Regional Disparities in Complementary Feeding Practices in India

Complementary feeding practices vary significantly among different regions and demographics in India, as highlighted by the data from the National Family Health Survey (NFHS-5) and the Comprehensive National Nutrition Survey (CNNS).

Urban-Rural Disparities

NFHS-5 data reveal stark differences in complementary feeding practices across urban and rural areas. Urban regions generally report higher adherence to timely complementary feeding, with 52% of infants aged 6–8 months receiving complementary foods on time compared to 43.9% in rural areas.

State-Level Variations

The scenario of complementary feeding practices also differs widely among states and union territories. States like Kerala and Tamil Nadu, recognised for their robust healthcare infrastructure and higher literacy rates, report higher compliance with timely complementary feeding. For instance, over 71.3% of infants in Kerala receive timely complementary foods. In contrast, states such as Bihar and Uttar Pradesh, which grapple with higher levels of poverty and lower literacy rates, report significantly lower compliance, with rates as low as 39% and 31% respectively.

Regional Insights

Regional differences, shaped by cultural and economic contexts, further highlight disparities. The southern states typically outperform others in complementary feeding indicators due to greater public health awareness and programmatic support. In contrast, northern and northeastern states often lag due to logistical challenges, cultural practices, and limited penetration of nutrition programs.

Implications of Disparities

These disparities highlight the urgent need for region-specific strategies to promote equitable complementary feeding practices.

Indicators of complementary feeding quality

Minimum Dietary Diversity(MDD), Minimum Meal Frequency(MMF) and Minimum Acceptable Diet (MAD)

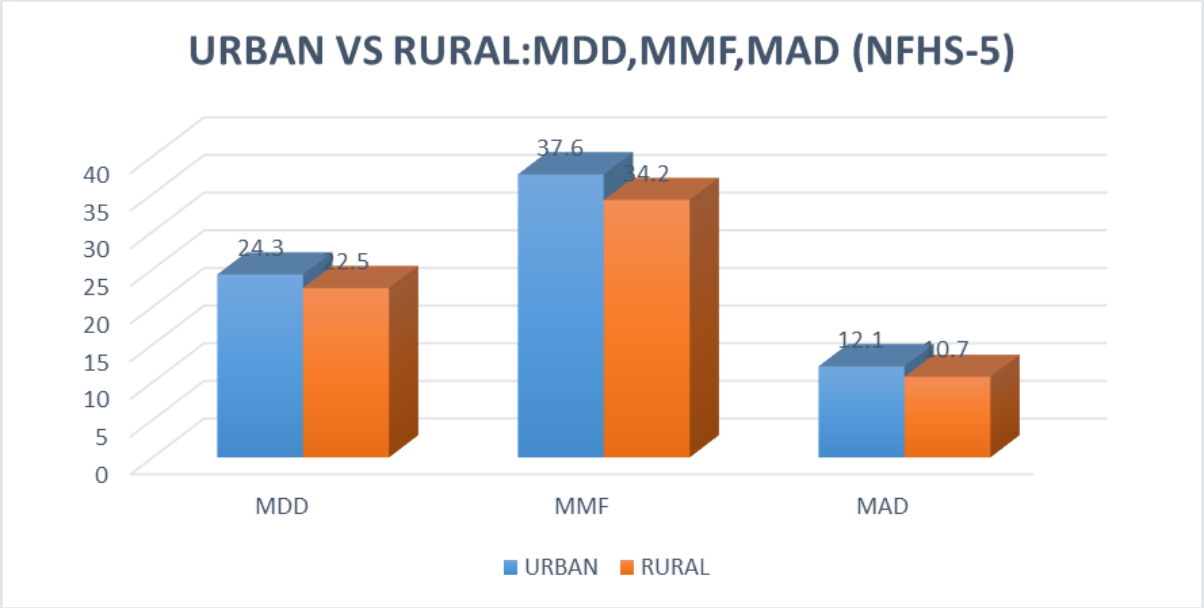
The dietary diversity and frequency of complementary foods depend on various factors, including place of residence, maternal education, religion, and economic status. Notable variations are also evident across states and regions, with certain states outperforming others.Minimum Acceptable Diet (MAD), being a composite indicator of dietary diversity and meal frequency, reflects the adequacy of feeding practices for children aged 6–23 months.

National Overview

According to NFHS-5, the Minimum Dietary Diversity (MDD),Minimum Meal Frequency (MMF) and Minimum Adequate Diet in India are 23%,35.1% and 11% respectively. These figures highlight the inadequacy in the variety, quantity, and quality of complementary foods provided to children. The Comprehensive National Nutrition Survey (CNNS) reports MDD, MMF and MAD among infants aged 6–23 months at 21%,42% and 6% respectively, showing slight differences in measurement outcomes.

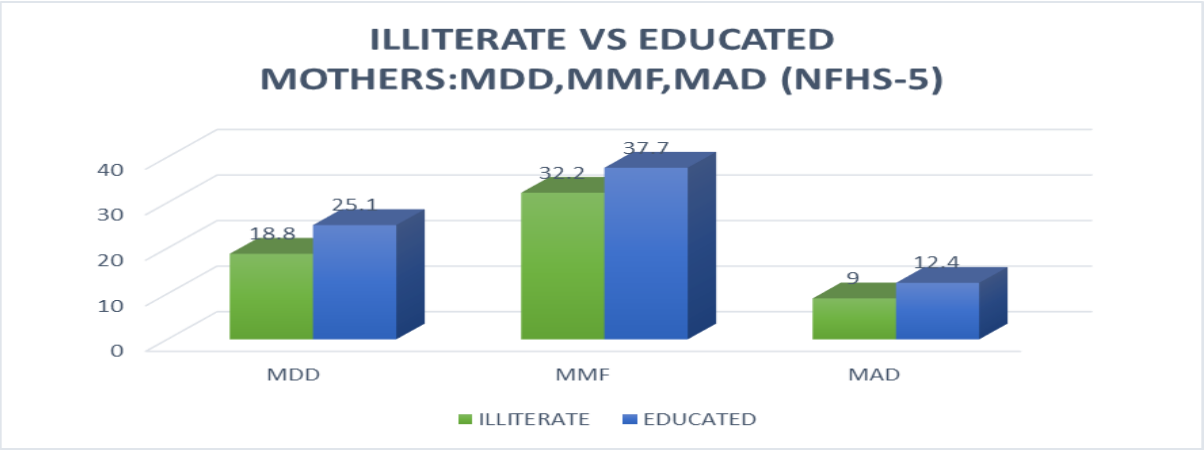
Urban-Rural Disparities

Urban areas consistently outperform rural areas in dietary diversity and meal frequency indicators. NFHS-5 data show that urban residents achieve MDD, MMF and MAD rates of 24.3%, 37.6%and 12.1%, compared to rural areas at 22.5%, 34.2% and 10.7%. CNNS data, however, provide slightly different figures: urban MDD and MMF are reported at 26.9% and 37%, while rural areas report MDD at 19% and MMF at 44%.



Maternal Education

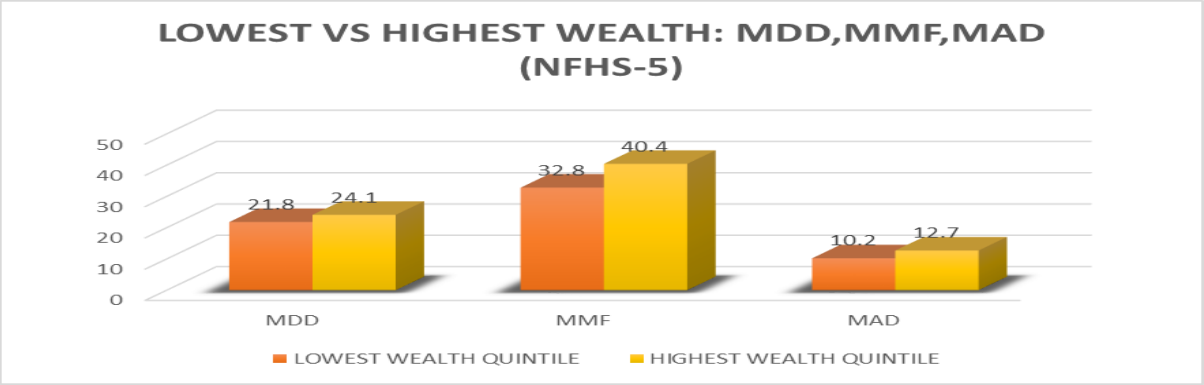
Maternal education is pivotal in complementary feeding practices. NFHS-5 data suggests that mothers with no formal education achieve MDD and MMF rates of 18.8% and 32.2%, respectively. In contrast, educated mothers report higher rates, with MDD at 25.1% and MMF at 37.7%.



Socio-economic disparities

Wealth plays a key role in determining MAD. According to CNNS,children from households in the highest wealth quintile (9%) exhibit a stronger tendency to meet MAD requirements in contrast to those in the lowest wealth quintile (3%). This disparity underscores the importance of socioeconomic status in accessing diverse and frequent complementary foods.Similarly NFHS-5 data shows that the Minimum

Dietary Diversity (MDD), Minimum Meal Frequency (MMF), and Minimum Acceptable Diet (MAD) indicators are notably higher in children in the highest wealth quintile, with values of 24.1%, 40.4%, and 12.7%, respectively, compared to 21.8%, 32.8%, and 10.2% in the lowest wealth quintile.



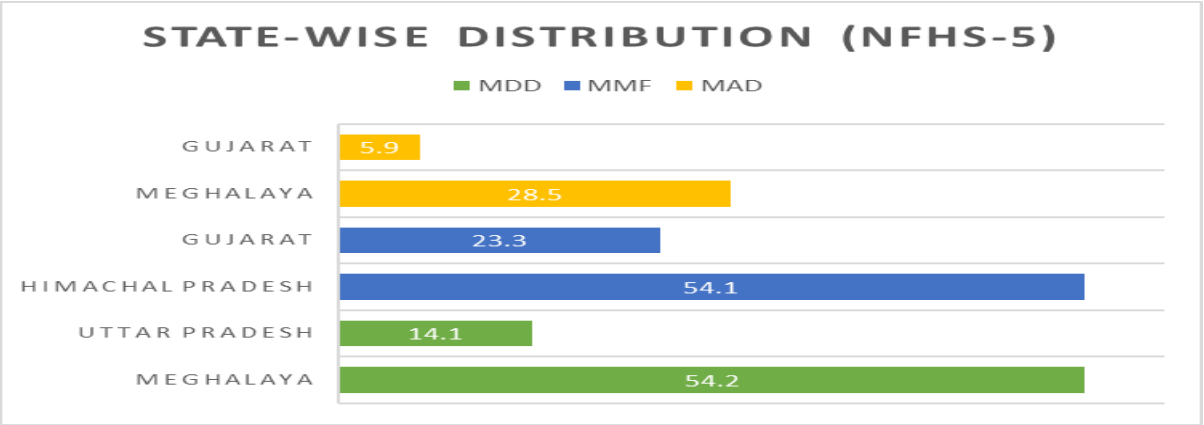
Religious Differences

Religious affiliations also impact feeding practices. NFHS-5 data reveal that Christians achieve the highest rates of MDD and MMF at 35.3% and 44.2%, respectively. Sikhs (24.7% and 34.4%), Hindus (22.1% and 35.1%), and Muslims (25.9% and 33.7%) follow. CNNS data, however, present a slightly different perspective: Sikhs (39%) and Christians (35%) excel in providing dietary diversity, while Hindus (43%) and Muslims (42%) perform better in meeting meal frequency requirements.

Implications

These findings highlight the Pressing need for targeted interventions to address disparities in complementary feeding practices. Strategies should focus on improving maternal education, addressing urban-rural gaps, and promoting culturally sensitive nutrition education to ensure equitable dietary quality and frequency for children across all demographics.

State-wise Distribution of Complementary Feeding Indicators



The chart shows differences in complementary feeding indicators across states (NFHS-5). Meghalaya performs well in MDD (54.2%) and MAD (28.5%), while Himachal Pradesh leads in MMF (54.1%). On the other hand, Gujarat has the lowest MAD (5.9%) and MMF (23.3%). The disparities in MDD, MMF, and MAD across states and regions are driven by a mix of socioeconomic, cultural, and policy-related factors. In contrast, low-performing states face systemic challenges, including poverty, limited healthcare access, and sociocultural barriers, which demand urgent attention to improve child nutrition outcomes.This

highlights the need for better nutrition programs in low-performing states.

Determinants and Barriers of Complementary Feeding Practices in India

Complementary feeding (CF) practices are shaped by a complex interplay of determinants and barriers that vary across regions, socioeconomic groups, and cultural contexts. Understanding these factors provides critical comprehension of the disparities observed in minimum dietary diversity (MDD), minimum meal frequency (MMF), and minimum acceptable diet (MAD).

Determinants of Complementary Feeding Practices

- **Maternal Education**: Educated mothers tend to introduce complementary foods at the right time and ensure diverse diets, driven by greater awareness and access to information[11]. For example, NFHS-5 data shows educated mothers achieve higher MDD (25.1%) and MMF (37.7%) compared to illiterate mothers (MDD 18.8%, MMF 32.2%).
- **Socioeconomic Status**: Wealthier households enjoy greater access to diverse and nutrient-rich foods, enabling stronger alignment with CF guidelines. The disparity is evident in MAD, where the highest wealth quintile achieves 9% compared to 3% in the lowest quintile[27].
- **Maternal Awareness and Health Service Utilization:** Regular antenatal care (ANC) visits and skilled assistance during childbirth significantly improve maternal knowledge of CF practices. Studies report that mothers with three or more ANC visits tend to meet MDD and MMF benchmarks [12].

Barriers to Complementary Feeding Practices

- **Lack of Maternal Knowledge and Conflicting Information:** Inadequate knowledge about optimal CF practices, coupled with conflicting advice from healthcare workers and family members, leads to delays in introducing complementary foods or reliance on nutritionally insufficient diets [13].
- **Cultural Beliefs and Practices:** Cultural norms often restrict the inclusion of specific food groups or delay CF initiation. For instance, certain communities prefer herbal concoctions or water over nutrient-dense foods, which hinders dietary diversity [14].
- **Resource Constraints and Maternal Workload:** Limited financial resources and time constraints faced by working mothers reduce their ability to prepare balanced meals. Rural areas encounter further challenges with market access and infrastructure, leading to low MDD and MMF percentages [15].
- **Limited Access to Nutritious Foods:** In underprivileged regions, affordability and availability of nutrient-rich foods remain significant barriers. Poor infrastructure further exacerbates these issues, affecting dietary diversity and frequency [16].

Implications of Suboptimal Complementary Feeding Practices

Suboptimal complementary feeding practices determine far-reaching consequences on the overall health and progress of children, particularly in low- and middle-income countries (LMICs) such as India. Poor feeding practices are strongly linked to malnutrition outcomes like stunting, wasting, and underweight, which significantly contribute to child morbidity and mortality.

Stunting and Its Burden

Stunting, defined as a height-for-age z-score below -2 SD in relation to the WHO Child Growth Standards median, is a critical marker of chronic undernutrition (UNICEF South Asia, 2015). Delayed initiation of complementary feeding is a key driver of stunting in India. Several studies have indicated that late

introduction of solid, semi-solid, or soft foods is linked to a higher incidence of stunting among children below the age of five [17,18]. Despite this, there is a gap in nationally representative studies investigating the specific association between delayed complementary feeding and stunting. Such data is necessary for tailoring infant and young child feeding (IYCF) policies and targeting high-priority groups to decrease the percentage of stunted children in India [19].

Mortality and Morbidity

Malnutrition, including stunting, is a leading cause of under-five mortality, contributing to over 45% of child deaths globally (UNICEF, 2018). Children experiencing suboptimal complementary feeding are not just at risk of impaired growth but also face increased vulnerability to infectious diseases due to weakened immune systems.

Cognitive and Economic Consequences

Beyond physical health, suboptimal complementary feeding has a profound impact on cognitive development and long-term economic productivity. Malnourished children often face developmental delays, reduced educational attainment, and diminished earning potential in adulthood, perpetuating cycles of poverty and poor health.

Geographic and Socioeconomic Disparities

The occurrence of stunting and other malnutrition indicators differs greatly across Indian states and socio-economic strata. Regions with higher poverty rates, limited maternal education, and cultural barriers to adequate infant feeding practices bear the brunt of these issues [20].

In conclusion, suboptimal complementary feeding practices significantly contribute to the burden of malnutrition in India. Addressing these practices through targeted, evidence-based interventions is crucial for enhancing child health and achieving global nutrition goals.

Public health interventions

Integrated Child Development Services (ICDS)

The Integrated Child Development Services (ICDS), launched in 1975, aims to reduce malnutrition and improve child health in India. It provides supplementary nutrition, health check-ups, nutrition education, preschool education, immunization, and referral services through Anganwadi Centers (AWCs) and workers (AWWs). A critical focus of ICDS is on complementary feeding—the introduction of appropriate foods to infants after six months of exclusive breastfeeding.

In recent years, **POSHAN Abhiyaan**, launched in 2018, has further strengthened the efforts of ICDS by integrating multiple nutrition and health initiatives. This national nutrition mission aims to reduce malnutrition, including stunting, undernutrition, and anemia, through a multi-sectoral approach.

Role of ICDS in Complementary Feeding

1. **Program Coverage** The ICDS program has made efforts to reach mothers and caregivers with information on complementary feeding practices. However, studies reveal limited reach and coverage. For instance, only 25% of mothers in Uttar Pradesh reported receiving advice on complementary feeding from ICDS workers [24]. Enhanced interventions integrating technical inputs and behavior change communication (BCC) have shown potential to improve coverage and complementary feeding practices [23].
2. **Quality of Counseling** While counseling on breastfeeding practices has improved, advice on complementary feeding remains inadequate. Less than 25% of caregivers receive guidance on critical

aspects such as dietary diversity, age-appropriate feeding, and meal frequency [25]. Training initiatives like CARE-India's Integrated Nutrition and Health Program (INHP) demonstrate that equipping Anganwadi workers with effective communication tools can enhance the quality of counseling [24].

3. **Nutritional Support** ICDS's Take Home Rations and Supplementary Nutrition Programs aim to make complementary foods accessible to low-income families. These initiatives also target maternal nutrition and food security, recognizing the intergenerational impact of malnutrition [26].
4. **Behavior Change Communication (BCC)** Anganwadi workers conduct BCC sessions to educate caregivers on appropriate feeding practices. Evidence suggests that integrating BCC into ICDS activities improves awareness and practices at the community level [23].
5. **Integration with Other Programs** ICDS operates in convergence with initiatives like POSHAN Abhiyaan and the National Nutrition Mission, leveraging technology, community participation, and policy focus to enhance its impact. Digital tools,for instance, have been introduced to improve monitoring and record-keeping at Anganwadi centers [26].
6. **Monitoring and Growth Tracking** Regular weight and growth monitoring conducted at Anganwadi centers enable early identification of malnutrition and feeding-related issues. These data-driven interventions ensure timely responses to address child health concerns.

Gaps in Public Health Interventions for Complementary Feeding in India

Despite the efforts of programs like ICDS and POSHAN Abhiyaan, significant gaps limit their effectiveness in addressing complementary feeding practices in India.

Resource Allocation and Program Placement

A critical challenge is the inequitable allocation of resources. High-burden states such as Bihar and Uttar Pradesh often receive inadequate program coverage and financial support compared to better-off regions. This mismatch stems from a universal approach rather than a needs-based allocation, which leaves the most vulnerable populations underserved [23].

Training and Support for Anganwadi Workers

Anganwadi workers (AWWs), central to ICDS implementation, often lack adequate training in nutrition and child health. Poor supervision, limited technical support, and insufficient resources hinder their ability to deliver effective behavior change communication (BCC) and counseling on complementary feeding practices [26].

Supply Chain and Program Execution Issues

Frequent interruptions in the delivery of nutritional materials and leakages in the food supply chain reduce the availability of resources at the community level. This exacerbates malnutrition, particularly among children in critical developmental stages who miss timely nutritional interventions [29].

Program Design and Community Engagement

The top-down structure of many interventions limits community involvement and accountability. While programs heavily emphasize nutritional supplementation, they often neglect cost-effective and sustainable solutions like caregiver education, hygiene promotion, and integration with other health initiatives. Enhanced community engagement and decentralized decision-making could address these gaps more effectively [26].

Addressing these gaps requires a focused approach involving equitable resource allocation, comprehensive training for AWWs, improved supply chain management, and a shift toward community-driven, multi-sectoral strategies for complementary feeding.Collaboration with NGOs has proven

effective in addressing some of these challenges. NGOs provide technical support, supervision, and capacity-building for AWWs, resulting in improved outcomes [29].

Recommendations for Improvement

Suboptimal complementary feeding practices, including inadequate dietary diversity, meal frequency, and timely initiation, are pervasive across India. These issues are driven by socioeconomic disparities, limited maternal education, cultural barriers, and insufficient integration of evidence-based approaches into existing public health programs. Indicators such as Minimum Acceptable Diet (MAD), Minimum Dietary Diversity (MDD), and Minimum Meal Frequency (MMF) remain alarmingly low, with significant regional, urban-rural, and socioeconomic disparities, as evidenced by findings from NFHS-5 and CNNS. These gaps underscore the urgent need for targeted and evidence-based strategies to enhance complementary feeding practices.

1. **Policy Interventions**

- **Develop Region-Specific Guidelines**: Collaborate with state governments to design tailored complementary feeding guidelines, addressing regional disparities in dietary diversity and frequency.
- **Mandatory Integration in Health Programs**: Embed complementary feeding education into maternal and child health policies to guarantee that all caregivers receive guidance during antenatal and postnatal visits[28].

2. **Programmatic Enhancements**

- **Culturally Tailored Training**: Enhance the capacity of Anganwadi workers (AWWs) through region-specific training programs, equipping them with culturally appropriate counseling techniques and visual aids.
- **Digital Engagement Tools**: Implement mobile-based applications and SMS systems to provide real-time, evidence-based feeding advice to caregivers in local languages.
- **Behavior Change Communication (BCC)**: Expand the scope of BCC sessions within ICDS to emphasize the importance of dietary diversity and meal frequency using practical, locally relevant examples.

3. **Community-Level Actions**

- **Peer-Led Support Groups**: Foster community-led support groups where experienced mothers mentor others on overcoming feeding challenges and improving dietary practices.
- **Food Demonstration Sessions**: Organize regular demonstrations of affordable, nutrient-rich recipes using locally available foods at Anganwadi centers and community halls.

4. **Research and Development**

- **Study Local Practices**: Conduct qualitative studies to explore cultural beliefs affecting feeding practices and use findings to develop context-specific interventions.
- **Evaluate Program Outcomes**: Regularly monitor the impact of complementary feeding interventions using WHO indicators (MAD, MDD, MMF) to identify gaps and best practices.

5. **Feasibility Considerations**

- Leverage existing ICDS and POSHAN Abhiyaan infrastructure to implement recommendations without requiring significant additional resources.
- Partner with local NGOs and private organizations to offer technical support, particularly for digital tools and behavior change communication.

6. Highlighting Multisectoral Collaboration

- Encourage collaboration between the Ministry of Women and Child Development, healthcare providers, academic institutions, and NGOs to develop comprehensive, evidence-based feeding guidelines.
- Promote partnerships with agricultural departments to enhance access to affordable, locally produced, nutrient-rich foods.

Conclusion

Implementing these evidence-based, culturally sensitive, and region-specific recommendations with urgency and coordinated efforts can significantly improve complementary feeding practices across India. Prioritizing these actions will address disparities, empower caregivers, and contribute to reducing the burden of childhood malnutrition, aligning with national and global nutrition goals.

References

1. World Health Organization (WHO), & United Nations Children's Fund (UNICEF). (2023). Complementary feeding: Family foods for babies and young children. World Health Organization. https://www.who.int/publications/
2. Indian Academy of Pediatrics. (n.d.). Parental guideline: Complementary feeding. https://iapindia.org/pdf/Ch-040-IAP-Parental-Guideline-Complementary-Feeding.pdf
3. Marques RFSV, Taddei JAAC, Lopez FA, Braga JAP. Breastfeeding exclusively and iron deficiency anemia during the first 6 months of age. Revista Da Associação Médica Brasileira 2014;60(1):18–22.https://doi.org/10.1590/1806-9282.60.01.006.
4. Fischer Walker CL, Rudan I, Liu L, Nair H, Theodoratou E, Bhutta ZA, O'Brien KL, Campbell H, Black RE. Global burden of childhood pneumonia and diarrhoea. The Lancet 2013; 381(9875):1405–1416.https://doi.org/10.1016/S0140-6736(13)60222-6.
5. Siimes MA, Salmenperä L, Perheentupa J. Exclusive breast-feeding for 9 months: risk of iron deficiency. J Pediatr. 1984;104:196–9. Medline:6694011 doi:10.1016/S0022-3476(84)80991-9.
6. Integrated Child Development Services (ICDS). Ministry of Women and Child Development, Government of India. https://wcd.nic.in:contentReference[oaicite:12]{index=12}
7. Poshan Abhiyaan: National Nutrition Mission. Ministry of Women and Child Development, Government of India.
8. Ministry of Health and Family Welfare (MoHFW). (2021). National Family Health Survey (NFHS-5), 2019–21: India Fact Sheet. https://dhsprogram.com/pubs/pdf/FR375/FR375.pdf
9. International Institute for Population Sciences (IIPS) & Ministry of Health and Family Welfare (MoHFW). (2021). National Family Health Survey (NFHS-5), 2019–21: India Fact Sheet. Retrieved from https://dhsprogram.com/pubs/pdf/FR375/FR375.pdf
10. Ministry of Health and Family Welfare (MoHFW), Government of India. Comprehensive National Nutrition Survey (CNNS), 2016–18: India Fact Sheet.
11. Rabbani, A., & Mukhopadhyay, S. (2019). Maternal education and socioeconomic factors influencing complementary feeding practices in India. BMC Public Health, 19, 7360.https://doi.org/10.1186/s12889-019-7360-6
12. Devi, K., & Yadav, R. (2021). Role of antenatal care in improving complementary feeding knowledge in India. MDPI Nutrition, 13(3), 825. https://doi.org/10.3390/nu13030825

13. Patel, V., & Joshi, A. (2020). Addressing knowledge gaps and conflicting information in complementary feeding. Journal of Health, Population, and Nutrition, 39, 215. https://jhpn.biomedcentral.com/articles/10.1186/s41043-020-00215-w
14. Singh, P., & Gupta, R. (2022). Influence of cultural beliefs on complementary feeding practices in rural India. Journal of Health, Population, and Nutrition, 40, 342. https://doi.org/10.1186/s41043-017-0093-2
15. Kumar, A., & Rao, S. (2023). Maternal workload and time poverty as barriers to complementary feeding. PubMed Central. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9341212
16. Sharma, D., & Verma, K. (2020). Impact of resource constraints on dietary diversity in infants. Cureus Journal of Medical Science, 12(3), e268854. https://www.cureus.com/articles/268854
17. Ahmad, I., Khalique, N., Khalil, S., et al. (2018). Dietary diversity and stunting among infants and young children: a cross-sectional study in Aligarh. Indian J Community Med, 43, 34–36 https://doi.org/10.4103/ijcm.IJCM_382_16
18. Chyne, D. A. L., Meshram, I. I., Rajendran, A., et al. (2017). Nutritional status, food insecurity, and biodiversity among the Khasi in Meghalaya, North-East India. Maternal and Child Nutrition, 13, 1 https://doi.org/10.1111/mcn.12557
19. Moffitt, R., Schoeni, R. F., Brown, C., et al. (2015). Assessing the need for a new nationally representative household panel survey in the United States. J Econ Social Meas, 40, 1,1-26. https://doi.org/10.3233/JEM-150411
20. Sinhababu, A., Mukhopadhyay, D. K., Panja, T. K., et al. (2010). Infant- and young child-feeding practices in Bankura District, West Bengal, India. J Health Popul Nutr, 28, 294–299.https://doi.org/10.3329/jhpn.v28i3.5559
21. UNICEF South Asia. (2015). Stop stunting in South Asia: A common narrative on maternal and child nutrition. UNICEF South Asia Strategy 2014–2017. http://stopstunting.org.
22. UNICEF. (2018). Malnutrition.https://data.unicef.org/topic/nutrition/malnutrition/.
23. Aggarwal, M., Chauhan, A., Rajpal, S., Joe, W., & Kumar, A. (2024). Utilization of Integrated Child Development Services (ICDS) and its linkages with undernutrition in India. Maternal & Child Nutrition, *20*(1), e13644. https://doi.org/10.1111/mcn.13644A
24. Singh, K., et al. (2017). Complementary feeding practices and their determinants in India. Journal of Health and Population Nutrition, 35(1), 34.https://doi.org/10.1186/s41043-017-0103-3
25. Dewey, K. G., & Adu-Afarwuah, S. (2008). Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries. Maternal & Child Nutrition, 4(s1),24-85.https://doi.org/10.1111/j.1740-8709.2007.00124.x
26. Paul, A., & George, R. (2023). Effectiveness of ICDS in Improving Child Nutrition and Complementary Feeding Practices: Evidence from NFHS-4 and NFHS-5. Social Science Research Network. https://doi.org/10.2139/ssrn.379663454
27. Das Gupta, M., et al. (2005). Socio-economic influences on child nutrition and feeding practices in India. World Bank Working Paper https://doi.org/10.1596/1813-9450-3647
28. Das Gupta, M., Lokshin, M., Gragnolati, M., & Ivaschenko, O. (2005). Improving child nutrition outcomes in India: Can the Integrated Child Development Services Program be more effective? World Bank Policy Research Working Paper Series (No. 3647). The World Bank. http://econ.worldbank.org
29. Singh, V., Ahmed, S., Dreyfuss, M. L., Kiran, U., Chaudhery, D. N., Srivastava, V. K., ... & West, K. P., Jr. (2017). Non-governmental organization facilitation of a community-based nutrition and health

program: Effect on program exposure and associated infant feeding practices in rural India. PLoS ONE, *12*(9), e0183316. https://doi.org/10.1371/journal.pone.0183316