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FIGHTING AGAINST MALNUTRITION: EVIDENCE BASED COMMUNITY APPROACHES THROUGH CMAM AND FOOD FORTIFICATION

Dr.B.Veerabhadrudu* and R. Rajendra Babu**
Vijayavahini Charitable Foundation
*State Program Officer, VCF and ** CEO, VCF

Abstract:

Malnutrition is a challenge that spread across the world and India is one of the largest contributing nations for malnutrition. Childhood is a significant stage of life and deficiency of nutrients during this period can have a long-term adverse impact on well-being of children. According to NFHS-5(2019-21) have shown modest improvements only compare with NFHS-4. According to NFHS-5 (2019-21) in India, 35.5% of stunting, 19.3% of wasting and 32.1% of underweight witnessed among children aged below 59 months. In addition to that anaemia found highly prevalent (67.1%) among children. Undernourished children have significantly higher risk of morbidity and mortality. Facility based services are limited to compensate all wasted children to provide necessary timely services and management. Despite of decades of several interventions, progress has uneven and slow. Community based management of acute malnutrition(CMAM) program focuses on early identification of SAM or MAM children before developing any medical complications and provides community level treatment for uncomplicated cases and referral of complicated cases to nearby health facilities. Under the program, malnourished children can be treated effectively in community settings that enables high recovery rates offering lower cost than facility based treatment.

Fortification is an innovation that focuses on addressing micronutrient deficiencies. It supplements CMAM by addressing micronutrient deficiencies often terms as “hidden hunger”. Staple foods such as rice, wheat flour, edible oil, salt and milk ensure nutrient delivery to marginalized communities through government implementation platforms like ICDS, PDS and PM-POSHAN. The integration of CMAM and Fortification has higher chances of prevention, treatment and nutrition outcomes. The current document highlights the integration of CMAM and Food Fortification to harness existing community platforms and networks, digital tools and state level innovations to improve effective utilization to reduce wasting, underweight, wasting and anaemia.

Key words: Malnutrition, CMAM, SAM, MAM, Food Fortification

Introduction:

Children are considered one of the most vulnerable groups to be at risk of morbidity and mortality in developing countries. Health is considered as one of the key indicators of human development as well as for society development. Malnutrition is a global problem that spread across the world and India is one of the largest contributing nations for malnutrition. Childhood is a significant stage of life and deficiency of nutrients during this period can have a long-term adverse impact on well-being of children. According to WHO[1], around 45% of deaths among children under 5 years of age are linked to undernutrition. Four children die every minute due to communicable diseases in India. In year 2023 alone, 6,43,970 children aged below 5 years died in India[2].Nutrient deficiency shows impacts the growth of physical and mental health of child which ultimately leads for slow development for a child. Nutritional deficiency shows negative impact for children aged 0-

[1] Fact sheets - Malnutrition (who.int)
[2] https://data.unicef.org/resources/data_explorer/unicef_f/?ag=UNICEF&df=GLOBAL_DATAFLOW&ver=1.0&dq=IND.CME_TMY0T4.&startPeriod=1970&endPeriod=2025

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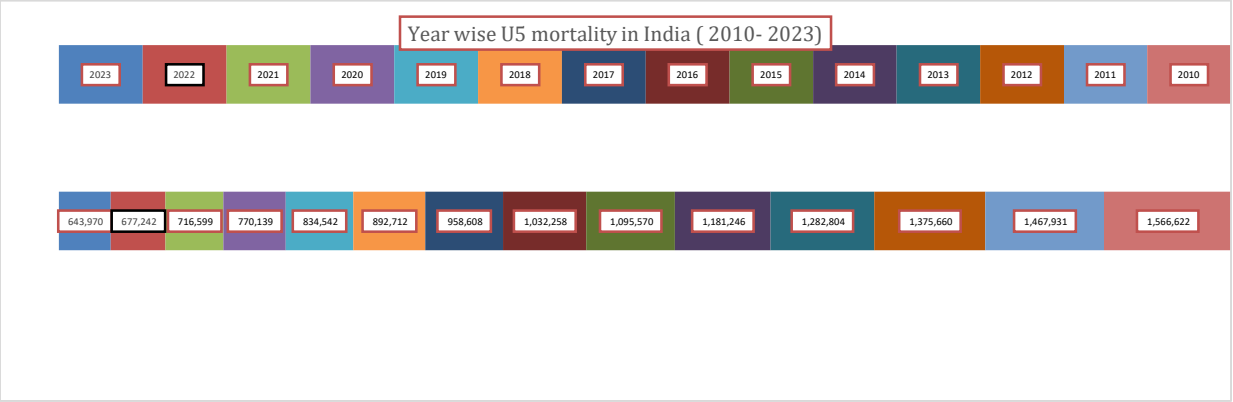
59 months. Nutrition is important for the skeletal development, which is a critical part of the growth process. Deficiency of nutrients can adversely affect the linear growth, cognition and muscle development.

Childhood undernutrition is an important public health and development challenge in India. Undernourished children have significantly higher risk of morbidity and mortality. Undernutrition also leads to growth retardation and impaired psychosocial and cognitive development. Undernutrition is associated with high rates of mortality and morbidity and is an underlying factor in almost one-third to half of all children under five years who die each year of preventable causes. Strong evidence exists on synergism between undernutrition and child mortality due to common childhood illnesses including diarrhoea, acute respiratory infections, malaria and measles[3].



Graph-1 – Trends in under 5 mortalities in India (in numbers)

source: Data warehouse, Unicef 2025

The negative consequences of malnutrition are long-lasting and affect the child's physical and mental development and health, including school performance as it lasts for a long time. Breastfeeding practices, immunization, the prevalence of infections and parasitic diseases due to lack of hygiene, insufficient dietary intake, including water and sanitation play a crucial part in the state of the nutritional health of a child. According to the National Family Health Survey (NFHS) report, about 45.5% of children are suffering from disorders associated with malnutrition in India[4]

Objective:

This is a review article that aims to analyse the status and prevalence of malnutrition, examining how it can hinder a country's overall development. Using secondary data and existing literature, it discusses appropriate strategies to address malnutrition at community level, along with the associated challenges and opportunities in implementing these strategies

Methodology:

This manuscript is based merely on secondary data and literature. Information was compiled from national surveys (NFHS-4 and NFHS-5), government reports, policy guidelines, and peer-reviewed studies published by organizations such as

[3] Operational Guidelines on Facility Based Management of Children with Severe Acute Malnutrition, Ministry of Health and Family Welfare Government of India, 2011
[4] Kamran Shaikh M, Kamble N, Bhawani D, Bele S, Sita RR. Assessment of nutritional status among school children of Karimnagar, Telangana, India. Int J Res Med Sci. 2016;4(1):4611–7

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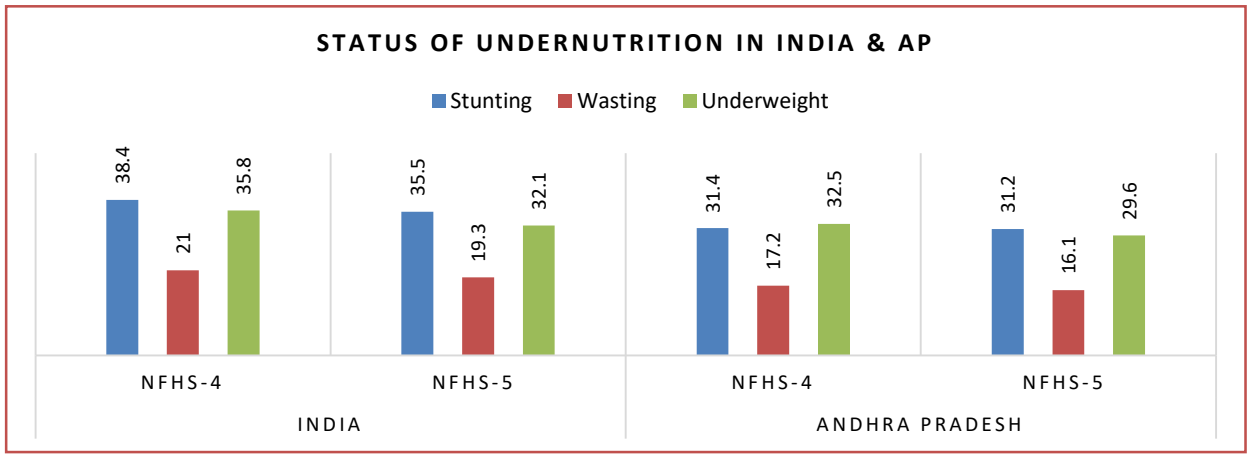
UNICEF, WHO, the World Bank, and The Lancet etc. A desk review approach was used to screen sources for credibility and its relevance. Data and evidences were thematically analysed to:

1. Assess the prevalence and trends of malnutrition in India and Andhra Pradesh,
2. Examine the effectiveness of the Community-Based Management of Acute Malnutrition (CMAM) approach, and
3. Identify implementation challenges, opportunities, and policy options

Limitation: No primary data collection was conducted, and the findings are dependent on the accuracy of the secondary sources reviewed

Graph – 2 Status of undernutrition in India and Andhra Pradesh



Source: NFHS-4 and 5

Causes for malnutrition:

Malnutrition is generally caused by a combination of deficiencies in food, health and inappropriate healthcare services. Even in conditions when food availability and purchasing power may be sufficient, poor monotonous diets which are low in quantity, quality and variety is often a major contributing factor for malnutrition. Therefore, it is very important to narrow the nutrition gap - the gap between what is grown, available and what is needed to improve nutrition.

Risk factors responsible for malnutrition are low birth weight, inappropriate breast-feeding practices, delay in initiation of complementary feeding with poor quality, food scarcity and poor hygiene. Malnutrition lowers the immunity of the child and increases the risk of infection. At the same time, infections result for loss of appetite, increased nutrient requirements and/or decreased absorption of nutrients consumed which can further aggravate malnutrition.

Malnutrition - a Constraint to National Development:

Childhood malnutrition represents one of the most significant impediments to national development in India, undermining human capital formation and long-term economic growth. Malnutrition during early childhood leads to stunted physical growth, impaired cognitive development, and increased vulnerability to infectious diseases (UNICEF, 2021). These deficits translate into reduced educational performance, lower productivity, and diminished earning potential in adulthood, creating a direct linkage between undernutrition and economic stagnation (Victora et al., 2021).

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Multiple forms of malnutrition (MOM) reduce nearly 8 per cent of the nation's economic growth owing to reduced schooling, cognitive impairments, compromised adult labour productivity, and increased healthcare costs. Asia and Africa lose 11% Gross National Product (GNP)every year owing to poor nutrition[5]. In fact, 17.3 per cent of India's productive years of life (disability-adjusted life years or DALYs) were lost last year alone due to MOM caused ill-health, disability or early death. Impressive economic benefits of $34.1-$38.6return from every $1invested are noted in reducing wasting and stunting in India[6]

The World Bank estimates that countries with high levels of childhood undernutrition can lose up to 2 to 3% of their GDP annually due to reduced productivity and increased healthcare expenditures (World Bank, 2016). In India, where 35.5% of children under five are stunted and 19.3% are wasted (NFHS-5, 2021), this translates into significant foregone economic output. The increased prevalence of micronutrient deficiencies also imposes a substantial financial burden on public health systems, diverting resources from infrastructure, education, and technological advancement (Global Nutrition Report, 2021).

Furthermore, malnutrition spreads an intergenerational cycle of poverty. Undernourished children grow into less productive adults, who are then less able to provide adequate nutrition for their own children, reinforcing socioeconomic inequality (Black et al., 2013). This dynamic undermines the demographic dividend that India hopes to leverage, as a young but undernourished population lacks the health and education levels required to drive rapid industrialization and innovation (UNICEF, 2021).

Strategies to combat malnutrition:

Addressing malnutrition, therefore, is not only a public health priority but a critical economic and social development strategy. Investments in maternal and child nutrition, food security, sanitation, and healthcare directly contribute to human capital development, which in turn fuels higher productivity, innovation, and inclusive growth.

A multidimensional policy response that integrates nutrition-specific interventions (such as supplementation and breastfeeding promotion) with nutrition-sensitive approaches (such as poverty alleviation, education, and women's empowerment) is essential to break this cycle and unlock India's full developmental potential (WHO, 2020)

The government of India evolved several nutritional interventions i.e., Food Fortification, PM-Poshan, Poshan Abhiyaan and Community based management of acute malnutrition (CMAM)

According to Copenhagen Consensus Center, & Tata Trusts, (Andhra Pradesh priorities, analysing costs and benefits, 2019) researchers look at micronutrient supplementation for pregnant women during ANC visits. The focus is on providing Vitamin A supplementation, iron, iodine, calcium, zinc and ORS. At a total cost of 88 crore rupees for one year in Andhra Pradesh, this intervention can avoid 106,882 cases of maternal anaemia, 25,293 low birth weight babies, 113 maternal deaths, 19,103 preterm births, 1,337 preterm deaths and 210 stillbirths in Andhra Pradesh. Each rupee spent targeting supplements to pregnant women in antenatal care would have benefits worth nearly 40 rupees.

These programs are in line with some of the [7]Sustainable Development Goals (SDGs) such as

- SDG 2- (zero hunger) which is directly addressing by reducing under nutrition
- SDG 3 (Good health and well-being) – reducing preventable child deaths under 5 years
- SDG 4 – (Quality Education) that focuses on improved learning outcomes from better child nutrition

[5] Global Nutrition Report 2014, McGovern 2017 FAO
[6] Hoddinott, J. et al., The economic rationale for investing in stunting reduction. Maternal and Child Nutrition, 2013. 9 (Suppl. 2):69-82
[7] https://sdgs.un.org/goals

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- SDG 5 – (Gender equality) for empowerment through maternal nutrition and
- SDG 8 – (Decent work and Economic Growth) for a healthier and more productive workforce

Strategies to tackle malnutrition:

There are 1057 NRCs in established across the country where facility based treatment to all SAM children may not feasible to looking at the case load. CMAM program offers maximum coverage and making services accessible, with timeliness of treatment. CMAM improves coverage, reduces delays in treatment, and lowers the burden on health facilities. it is particularly relevant in contexts where access to inpatient care is limited. The community based approach has proved cost-effectiveness of SAM management programs including out-patient management using RUTF has been shown to largely surpass the cost-effectiveness of inpatient SAM management without RUTF. The CMAM approach aids to create long-term community-based therapeutic care programme, decentralizes malnutrition care and treatment, increases the coverage and ensures that timely and appropriate care is easily accessible to all malnourished children residing even in isolated areas (Mathur M, 2018). [8]The cost per life-year saved of a child below 5 years due to SAM is $125.12 This means an investment of $125 is required to save the life of 1 child for 1 year. (For India: There are 9300000 SAM children in India. To save the lives of all those in 1 year, an investment of $11,625,000,000 (9300000X125) is required for 1 year.

An estimated number of SAM children in selected states and India based on calculation from NFHS 4 data for children under-5 years
Number of SAMhildren*

S.No	Name of the State	No of SAM children
1	Rajasthan	700000
2	Maharashtra	1000000
3	Madhya Pradesh	1000000
4	Jharkhand	510000
5	India	9300000

To address the issue of wasting in children across country, there is a need of convergence of health and nutrition indicators is priority at policy level. It is crucial to develop necesary strategies to prevention and management of malnutrition among children through effective and sustained community based interventions to reduce the burden of malnutrition.
Community – based management of acute malnutrition has proven as effective in terms of addressing of acute malnutrition at community settings. It also has proven cost-effective than facility treatment with prompt care with necessary treatment. The CMAM program has key steps such as screening and identification of children, Appetite test, medical assessment and management, providing energy dense nutritious food, timely follow-up visits for health and nutrition counselling, regular monitoring and reporting by engaging of multiple stakeholders through enhancing capacities to adhere the protocols of the program for effectiveness to get better outcomes. It offers a comprehensive services at community settings that allows communities for active engagement

Considering the burden of Severely Acute Malnutrition (SAM) in India and the availability of SAM treatment at facility level, it is operationally not feasible to treat all SAM children. Treatment of severe acute malnutrition (SAM) has undergone a paradigm shift over the past decade through the introduction of Community-based Management of Acute Malnutrition (CMAM) in over 60 countries. Under this approach, treatment has moved away from expensive, resource-constrained hospital settings towards the community-based management. The data evidence of CMAM is encouraging and it points toward the achievement of significant mortality reductions in a cost effective manner (Meeta Mathur, et al., 2018)

[8] Community-based management of acute malnutrition (CMAM) in India: a position paper- 2018- DOI: 10.18203/2320-6012.ijrms20184920

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Food Fortification as a Nutrition Strategy:

Food fortification is the process of deliberately increasing the essential vitamins and minerals in generally consumed foods to improve its nutritional quality and deliver public health benefits without requiring any change in dietary habits. Fortification has been implementing comprehensively focusing on staple foods i.e., rice, wheat flour, edible oil, iodine salt and milk through incorporating micronutrients like iron, folic acid, Vitamin B12, vitamin A and D. The objectives of the intervention are to address the problem of micronutrient deficiencies contributing for under nutrition among children, with impaired physical and mental development.

NFHS-5 (2019-21) data clearly revealed that 67.1 % of children aged 6-59 months and 57.1% of women aged 15-49 months suffer from iron deficiency anemia. Enriching of staple foods with fortification incorporating micronutrients and key vitamins provides largely supporting communities from nutritional deficiencies without making any changes in their dietary practices. Fortified foods through various programs reaching even more vulnerable population. The convergence of CMAM and fortification through Poshan Abhiyaan can be effective to address malnutrition and improve child feeding practices
In India, Fortification of staple foods have been doing through following the standards of Food Safety and Standards Authority of India (FSSAI). For instance, the Public Distribution System (PDS) is distributing rice for Mid-Day Meal (MDM) program, as well fortified wheat flour, edible oil and milk and salt supplies through Integrated Child Development Services (ICDS) with integration of iron, folic acid, Vitamin B12 to combat anemia. Milk and edible oil are usually fortified with Vitamin A and Vitamin D. To maintain standards of safety and efficacy, quality control mechanisms testing of products and distribution points are very much required
The benefits of food fortification are far-reaching. It is a highly cost-effective strategy, the Copenhagen Consensus estimated that every rupee spent on fortification results in nine rupees in benefits to the economy[9]. Since it builds upon existing delivery platforms such as PDS, ICDS, and MDM schemes, fortification offers equitable coverage and sustainable impact. When combined with maternal health initiatives, immunization, WASH programs, and dietary diversification campaigns, it leads for a foundation of India's broader nutrition strategy.

Need for a National Level Policy on CMAM:

The community-based management of acute malnutrition (CMAM) is being implementing in several states through following state-specific guidelines, emphasizing on improved coverage by enhancing the knowledge and skills of frontline workers to adhere the protocols and strengthening the monitoring for effective implementation to benefit children. The Government of India has released a comprehensive CMAM guidelines in October 2023. States have integrated growth monitoring and promotion to identify children with MAM and SAM, linking them to facility- and community-based care through DWCD and DHFW [10]functionaries. Services include screening, treatment for MAM to prevent SAM, referral of complicated cases, community-level provision of medicines and nutrient-dense foods for uncomplicated SAM, and discharge after target weight is achieved with continued follow-up.

Major components of CMAM program:

1. Early detection of SAM and MAM before developing any medical complications among children - Screening and identification of children with SAM and MAM
2. Strategy: Prevention and Management of malnutrition among children aged 6-59 months
3. Management of Children with SAM & MAM at community (uncomplicated SAM) and complicated at facility (PHC/NRCs)
4. Comprehensive care to children till they come out of acute malnutrition

[9] Fortifying Food and Fortifying India, a outlook initiate
[10] DWCD: department of women and child development – DHFW- Department of health and family welfare

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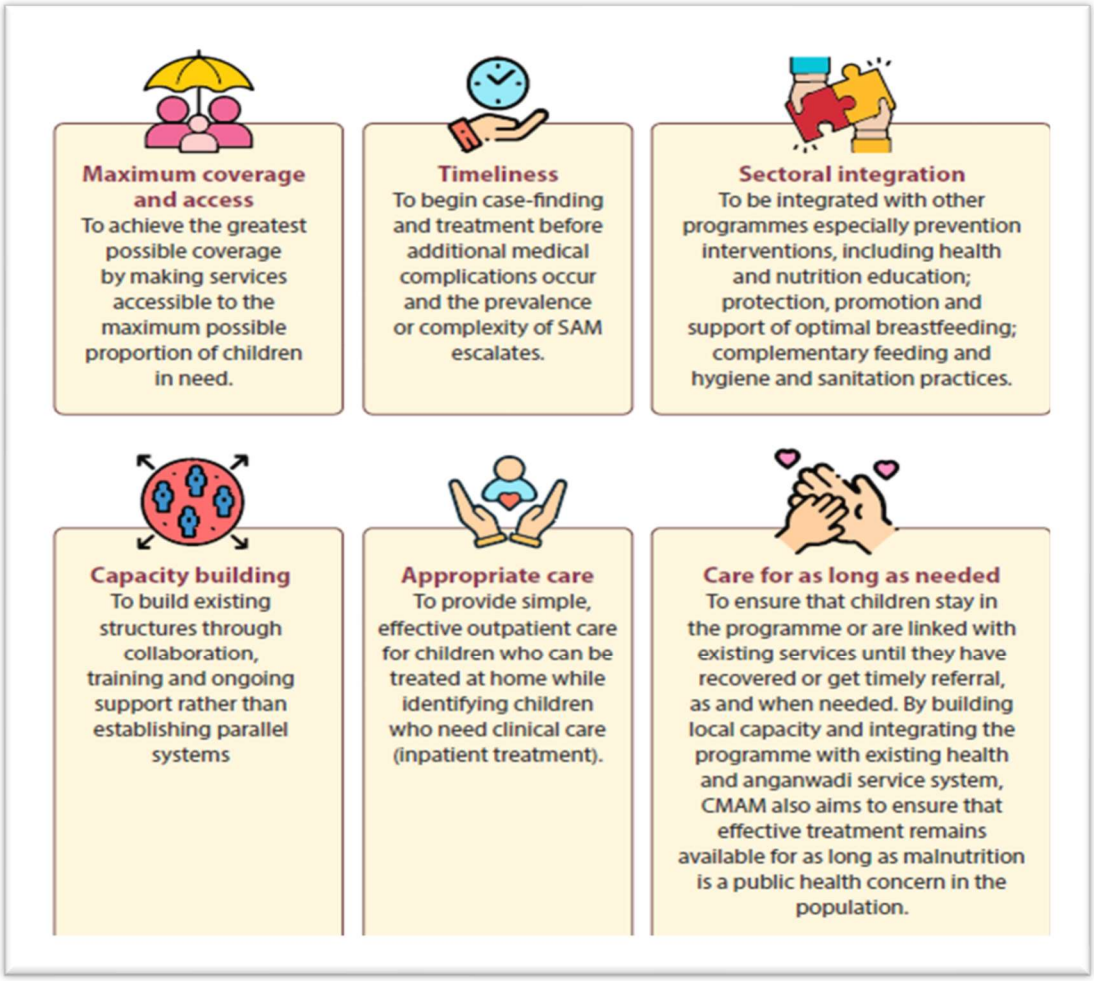
Core operating principles of CMAM program:



Source: Transforming Child Nutrition NITI-AAYOG Report- 2023

The practices under community mobilization cover a range of Information Education Communications (IEC)activities such as community meetings, media engagement, social audits, rallies, wall paintings and food related games, among others. These activities help Anganwadi Workers (AWWs), Accredited Social Health Workers (ASHAs), Auxiliary Nurse Midwives (ANMs) and Anganwadi Services Supervisors to interact with the community and families, thereby building a relationship with them and encouraging their participation in the programme

Challenges towards CMAM program:

According to NITI-AAYOG 2023 report, in India, 14 states across the country have been implementing the program either in few pockets or in all the districts with a variety of names like CMAM, CCMAM, SSFP, AMMA etc. The national level guidelines have given further direction to the states to follow through contextualize as per need for effective implementation. Despite of numerous efforts, there are a few challenges that hindering effectiveness of CMAM program

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Overall challenges and opportunities for CMAM and Food Fortification:

Challenges:

- limited awareness of communities on importance of nutrition and consequences of malnutrition
- limited knowledge of front line workers in adherence of CMAM protocols which further implies strengthening of capacity building of key stakeholders
- limited knowledge on Food Fortification and its importance
- Geographical, socio-economic and cultural barriers towards both the programs
- limited active community participation
- Supply chain related issues especially in remote locations
- limited referral and follow-ups
- Myths and misconceptions
- Non availability of children enrolled in the program (high defaulter rate rates noted in several states due to short term migration of families to other locations)

Opportunities:

- National level guidelines are available
- Convergence of government departments for improved effectiveness – particularly for frontline workers
- Integration with existing platforms – leveraging ICDS, NHM, Poshan Abhiyaan, and VHSND for better out reach
- Capacity building – knowledge of frontline workers through structured modules
- Usage of digital tools – capturing data through using mobile applications for enhanced case detection and improved reporting
- Developing SBCC for increased engagement of communities
- Active engagement of NGOs and CSR initiatives and other agencies to strengthen supply chains and service delivery
- Technology can be used as a medium to track outcomes on regular basis
- Convergence of health and nutrition interventions aligning with CMAM program
- Documentation of best practices to scale up and advocacy
- Community ownership and active engagement for building trust and sustenance
- States commitment and focus on nutrition with viable actions

Overall recommendations:

- Convergence of CMAM and Fortification to address malnutrition effectively
- Integration of food fortification strategies into operational guidelines
- Effective distribution of fortified staple foods to vulnerable populations through various government platforms i.e., PDS, PM-POSHAN and ICDS
- Decentralization of production units through using locally available ingredients to reduce the prices as well active engagement of communities
- Periodical capacity building of frontline workers to ensure adherence of protocols
- Develop user friendly digital tools for effective monitoring and to establish timely follow mechanism
- Focus on community awareness activities to improve communities understanding and acceptance
- Effective engagement of NGOs, CSR initiatives


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Conclusion:

For reduction of malnutrition, India should adopt a dual strategy prevention and management of SAM and MAM children through CMAM program and prevention of micronutrient deficiencies through fortification. Convergence of CMAM and Food Fortification programs enables effectiveness and sustenance.
Usage of technology can strengthen real time monitoring and timely management. Working on locally acceptable and available production food models enhance access and quality of nutrient dense foods even in remote areas. Decentralization of production and engagement of various key stakeholders with integrated approach reduces under nutrition and anaemia.

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