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Coalition for Food-Systems Transforma(c)tion in India

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FOOD AND NUTRITION EDUCATION IN SCHOOLS IN INDIA:

A Discussion Paper

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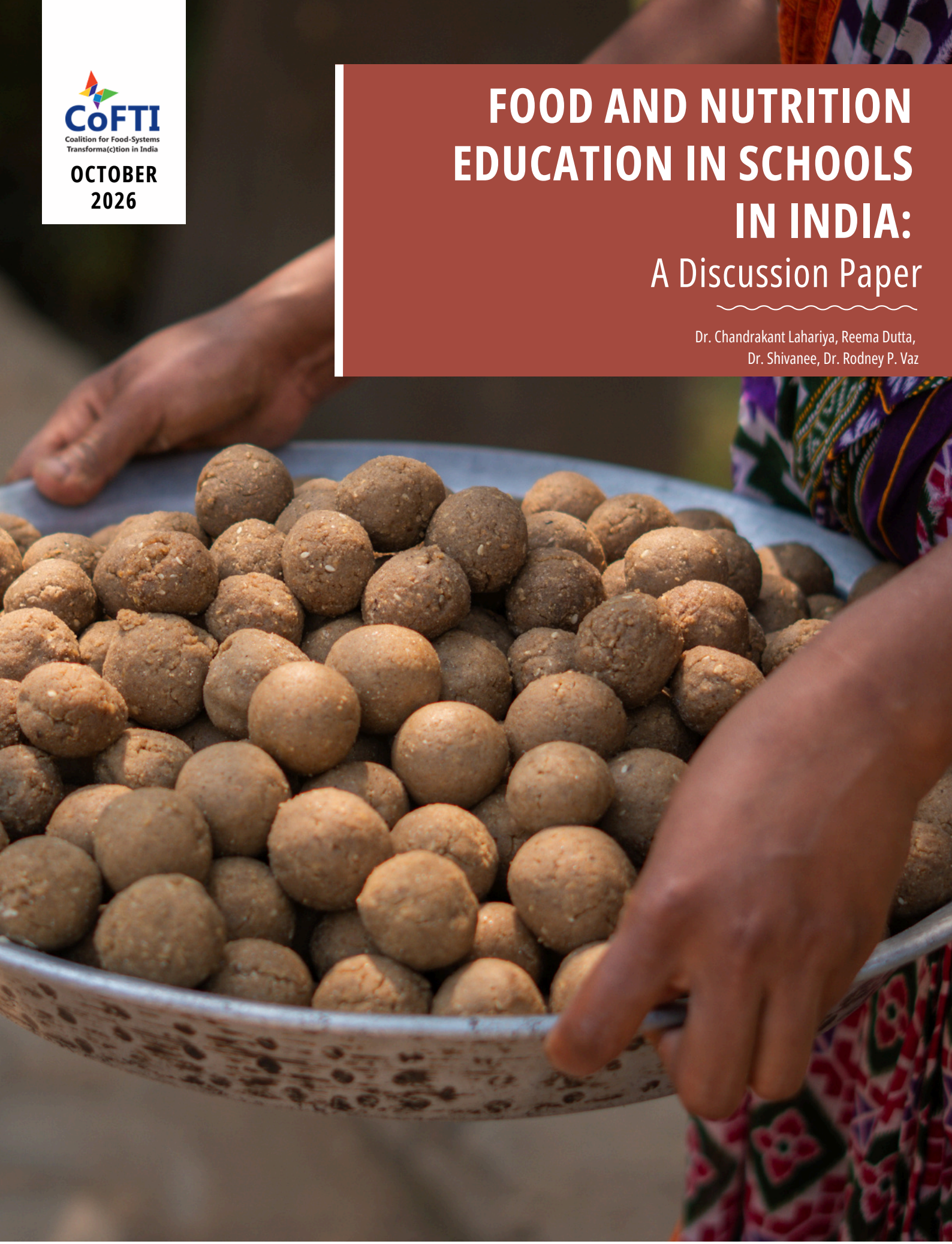

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FOOD AND NUTRITION EDUCATION IN SCHOOLS IN INDIA: A Discussion Paper

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About CoFTI

The **Coalition for Food-Systems Transforma(c)tion in India (CoFTI)** was born out of the United Nations (UN) Food Systems Summit 2021 with a commitment to reshaping India's food system so that safe and nutritious food is accessible to all. Its mission addresses hunger and malnutrition while championing biodiversity, climate resilience, and the protection of livelihoods. By bringing together diverse stakeholders, CoFTI works to create sustainable and equitable solutions that balance the needs of people, planet, and economy. Grounded in the Sustainable Development Goals (SDGs), the Coalition drives positive change across seven key areas of work, ensuring that India's food systems remain resilient for both present and future generations.

CoFTI's approach is anchored in **three core objectives**.



Through these objectives, CoFTI serves as both a catalyst and a convener, ensuring that India's journey towards a just, sustainable, and nourishing food future is grounded in shared purpose and actionable solutions.

CoFTI Core Group comprises of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Welthungerhilfe India (WHH), Food Future Foundation (FFF), and Watershed Support Services and Activities Network (WASSAN), which hosts the Secretariat of CoFTI.

The Core Group has evolved to CoFTI's Transformation Council (2025–26), a strategic advisory body driving high-potential initiatives through a cross-sector cohort. It unites civil society, government, academia, and private sector stakeholders to advance collaborative food systems transformation in India.

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Table of Contents

EXECUTIVE SUMMARY 1

1 **FOOD AND NUTRITION EDUCATION- WHY AND WHY NOW?** 4

2 **MATERIALS AND METHODS** 7

3 **WHY SCHOOLS FOR HEALTH AND NUTRITION EDUCATION?** 9

3.1. Why Schools Matter?
3.2. Existing Indian Programmes and Policy
3.3. Implementation
3.4. What the Discussion Paper Proposes

4 **PROGRAMMES SUPPORTING NUTRITION EDUCATION: KEY REFLECTIONS** 11

4.1. Discussion Paper Direction
4.2. POSHAN Abhiyaan
- Relevance for School-Based Nutrition Education
- Proposed School-based Approaches

4.3. FSSAI's 'Eat Right School Initiative'
- Official Programme Scope
- Relevance for School-Based Nutrition Education
- Proposed School-Based Approaches

4.4. School Health and Wellness Programme under Ayushman Bharat
- Official Programme Scope
- Relevance for School-Based Nutrition Education
- Proposed School-Based Approaches

4.5. National Education Policy 2020 and Curriculum Integration
- Proposed School-Based Approaches

4.6. Sugar Board Initiative under School Health Guidelines
- Proposed school-based approaches

4.7. Incorporation of Nutrition Education in school

5 **GLOBAL CASE STUDIES AND POTENTIAL MODELS FOR FOOD AND NUTRITION** 15

5.1. Global Case Studies
- Case Study 1: Indonesia - Makan Bergizi Gratis (MBG)
- Case Study 2: Mexico - Ban on Junk Foods in Schools
- Case Study 3: Kenya - Food4Education initiative
- Case Study 4: Ghana- School Feeding Programme
- Case Study 5: Japan - The Shokuiku Initiative for Food Education
- Case Study 6: Brazil - The National School Feeding Program (PNAE)
- Sustainable Environmental Practices and Healthy Diet
- Case Study 8: Singapore - Trim and Fit (TAF) Program
- Case Study 9: The United States - The National School Lunch Program (NSLP)
- Case Study 10: Finland - The Finnish School Meal Program
- Case 11: South Korea - The School Meal Program (SMP)

5.2. Lessons from International Models: Key Lessons for Enhancing School Based Nutrition Programs in India
- Incorporating Food and Nutrition Education into School Curriculum
- Bridging with Local Food Networks
- Supporting Quality and Variety in Educational Meal Programs
- Synthesizing Food Culture and Behavior Change Communication
- Strengthening Monitoring and Accountability

6 **KEY STAKEHOLDERS AND THEIR ROLES- RECOMMENDATIONS** 23

7 **DEMAND-SIDE INTERVENTIONS: BEHAVIOURAL AND EDUCATIONAL APPROACHES** 25

7.1. School-Based Food and Nutrition Education
7.2. Parental and Community Engagement
7.3. Experiential Learning
School Food Environments and
7.4. Behavioural Nudges
7.5. Digital and media-based nutrition awareness campaigns

8 **ROLE OF SCHOOL-BASED FOOD AND NUTRITION EDUCATION** 29

8.1. Key Components of Effective Nutrition Education
8.2. Laying the Foundation
8.3. Developmentally Appropriate Curriculum from Early Childhood through Secondary School
8.4. Emphasis on Food Culture and Sustainability
8.5. Skill-Building Activities
8.6. School-Based Nutrition Education as a Public Health Strategy
8.7. Building Lifelong Healthy Eating Habits
Interdisciplinary Learning Through Nutrition
8.8. Empowers Informed Consumers Who Make Healthier Food Choices

9 **POLICY RECOMMENDATIONS AND WAY FORWARD** 34

9.1. Reinforcing the Urgency: The Need for an Educational Pivot
9.2. Making health and Nutrition Education structured and integrated in the Curriculum
9.3. Multi-Stakeholder Collaboration: A Whole-of-Society Approach
9.4. Operational Roadmap for Implementation
9.5. Policy Recommendations to Tackle the Dual Burden of Childhood Obesity and Malnutrition in Schools
9.6. Institutionalize Food and Nutrition Education
9.7. Create Supportive Food Environments in Schools
9.8. Prioritize Equity and Inclusion
9.9. Strengthen Multi-Sectoral Collaboration
9.10. Invest in Capacity Building and Resources
9.11. Embed Monitoring, Evaluation, and Adaptive Learning
9.12. Adopt a Life Course Perspective

10 **REFERENCES** 40

11 **ANNEXURES** 45

List of Abbreviations

Abbreviation	Full form
ASER	Annual Status of Education Report
BCC	Behavior Change Communication
BMI	Body Mass Index
BMZ	German Federal Ministry of Economic Cooperation
CBSE	Central Board of Secondary Education
CC BY-NC-SA	Creative Commons Attribution-Non Commercial-ShareAlike
CEO	Chief Executive Officer
CNNS	Comprehensive National Nutrition Survey
CoFTI	Coalition for Food-Systems Transformation in India
CSR	Corporate Social Responsibility
FAO	Food and Agriculture Organization
FFF	Food Future Foundation
FSSAI	Food Safety and Standards Authority of India
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HFSS	High in Fat, Sugar and Salt
ICT	Information and Communication Technology
LMICs	Low- and Middle-Income Countries
M&E	Monitoring and Evaluation
MBG	Makan Bergizi Gratis
NCDs	Non-Communicable Diseases
NCERT	National Council of Educational Research and Training
NCF	National Curriculum Framework

Abbreviation	Full form
NCPCR	National Commission for Protection of Child Rights
NEP	National Education Policy
NFHS-5	National Family Health Survey-5
NGOs	Non-Governmental Organizations
NIPUN	National Initiative for Proficiency in Reading with Understanding and
NSLP	National School Lunch Program
PM POSHAN	Pradhan Mantri Poshan Shakti Nirman
PNAE	Programa Nacional de Alimentação Escolar
PTMs	Parent-Teacher Meetings
SDGs	Sustainable Development Goals
SMCs	School Management Committees
SMP	School Meal Program
TAF	Trim and Fit
UDISE+	Unified District Information System for Education Plus
UN	United Nations
UNICEF	United Nations Children's Fund
UPFs	Ultra-Processed Foods
WASH	Water, Sanitation and Hygiene
WASSAN	Watershed Support Services and Activities Network
WFP	World Food Programme
WHO	World Health Organization
WHH	Welthungerhilfe India

Executive Summary

India faces a significant challenge in addressing malnutrition, which includes undernutrition, overnutrition, and micronutrient deficiencies. Despite advancements in reducing hunger, data from NFHS-5 (2019–21) indicates that 35.5% of children under five are stunted, 19.3% are wasted, and 32.1% are underweight. The rise in childhood obesity, from 2.1% in 2015-16 to 3.4% in 2019–21, alongside high rates of iron-deficiency anemia among adolescent girls, reveals the intertwined issues of poverty and unhealthy diets. These statistics highlight a nutritional gap alongside broader lifestyle-related concerns, including sedentary behavior, sleep deprivation, stress, and marketing of ultra-processed foods, with implications for physical health, mental well-being, productivity, and future human capital. The Discussion Paper suggests a transformative approach that connects food literacy with lifestyle medicine to promote preventive health behaviors from a young age. The Discussion Paper proposes a comprehensive life-course approach to preventive health, transitioning from food supplementation and awareness campaigns to a lifestyle medicine framework emphasizing six health pillars: nutrition, physical activity, sleep, stress management, social connection, and avoidance of harmful substances. Schools represent an ideal environment to instill these principles, as habits formed in childhood significantly influence future health outcomes. By fostering balanced routines early on, India can shift from reactive disease management to proactive health creation.

Schools play a vital role in health promotion as children develop food habits during their formative years. School-based nutrition education is acknowledged worldwide for enhancing dietary quality, promoting critical thinking regarding food marketing, and encouraging sustainable healthy behaviors. Schools provide a strategic opportunity to combat malnutrition, as children spend much of their formative years in classrooms, where habits formed can impact lifelong dietary choices and health. Research links behaviors like skipping breakfast and reliance on packaged foods to obesity and chronic diseases. School-based nutrition education programs worldwide have shown effectiveness in improving diet quality and resistance to unhealthy food marketing. In India, with around 250 million children in 1.5 million schools, there is significant potential for positive change, as schools not only supply meals through the PM POSHAN scheme but also influence values and critical thinking about food literacy and health.

The Discussion Paper presents a holistic model encompassing four dimensions: Food and Nutrition Literacy, Healthy Lifestyle Habits, Behavioural and Emotional Well-being, and Sustainability and Culture. These interconnected pillars aim to transform schools into "laboratories for living well," integrating learning with everyday life. Creating lifelong habits involves behavioral design and supportive environments rather than one-time lessons. The paper discusses various low-cost, high-impact strategies like Sugar Awareness Boards, and Healthy Canteen Committees to normalize healthier choices through positive reinforcement. Additionally, it suggests digital gamification and peer-led wellness clubs to make healthy living aspirational for children and adolescents.

The Discussion Paper proposes an integrative approach to preventive healthcare and lifestyle medicine within schools, emphasizing the importance of movement, rest, and emotional balance in addition to nutrition. It proposes that schools develop into comprehensive wellness ecosystems that incorporate physical activity, sleep, stress management, and digital mindfulness. Key strategies include implementing behavioral science frameworks like cue–routine–reward systems, with teachers trained as "Food and Lifestyle Coaches" to support students in adopting healthy habits. The document also emphasizes strengthening teacher capacity through enhanced training in food literacy and lifestyle education, proposing the creation of a national cadre of Food and Lifestyle Coaches to foster health habits among students and families.

India's nutrition and school-health initiatives, including PM POSHAN and POSHAN Abhiyaan, operate through different institutional and implementation frameworks. PM POSHAN addresses nutritional status, classroom hunger, and school participation, while the paper identifies scope for stronger integration with nutrition literacy. The Eat Right School initiative encourages safe and healthy food practices among students, while the Ayushman Bharat School Health Programme involves trained teachers in promoting health and wellness. The National Education Policy 2020 provides a broader framework supportive of holistic health, well-being, and experiential learning. The paper identifies scope for strengthening experiential learning, teacher capacity, and coordination across these initiatives to enhance food and nutrition education. The proposed framework integrates India's existing national initiatives, including PM POSHAN, FSSAI's Eat Right School, POSHAN Abhiyaan, Ayushman Bharat, and NEP 2020.

Global examples and experiences provide valuable insights for India in the development of school food and nutrition education programs. Examples include Indonesia's Makan Bergizi Gratis, which features government-led initiatives with nutritionist-designed menus, and Mexico's junk food ban in schools, showcasing government regulatory influence. Kenya's Food4Education connects local farmers with schools, improving nutrition and local economies, while Japan's Shokuiku merges cultural traditions with food education. Brazil's PNAE mandates nutrition oversight and local sourcing, and Finland and South Korea demonstrate the benefits of universal free meals for equity. Singapore's Trim and Fit program shows the complexities of obesity management.

These multi country case studies incorporate nutritionist-led menus and school junk food bans. Key strategies include farm-to-school linkages, universal meal provision, and integrating cultural heritage into nutrition education. These models show that political commitment, local sourcing, and experiential learning lead to significant health and educational benefits.

India can further strengthen its existing government programmes by adopting these strategies, such as incorporating nutritionist-led menus, banning marketing and sales of ultra processed food products near schools, enforcing local food sourcing, and promoting hands-on learning through gardens and cooking classes. The proposed policy roadmap includes integrating food and lifestyle education into the school curriculum across grades, nutrition profiling, and regulation of canteens. Partnerships with teacher training institutions, FSSAI, and health agencies could support capacity building, quality assurance, and data-driven feedback.

The effectiveness of school-based nutrition initiatives hinges on the collaboration of various stakeholders. At the national level, ministries of Education, Health, and Women and Child Development establish policies, while state and district education departments implement them in schools through principals, teachers, and canteen staff. Community members, including School Management Committees, parents, and local NGOs, play key roles in accountability and cultural respect. International organizations like UNICEF and WFP provide technical support and best practices. Importantly, children actively engage in promoting healthy behaviours through peer-led initiatives. Successful implementation requires defined roles, ongoing training, and effective feedback mechanisms.

School settings impact various lifestyle behaviors, including diet, physical activity, hygiene, sleep, and mental well-being. By integrating nutrition education with these aspects, holistic development and long-term disease prevention can be achieved. The paper proposes grade-wise milestones for habits such as eating breakfast, maintaining hydration, and engaging in physical activity.

The paper proposes that effective nutrition programs place greater emphasis on education and behavior modification, integrating food literacy into school curricula and utilizing experiential learning methods like cooking workshops. Behavioral nudges, such as healthier food options in canteens and engaging digital campaigns, encourage better food choices among students and their families. The proposed developmentally appropriate and culturally sensitive curriculum would start with playful activities in early childhood , progressing to practical skills in middle school and connections to health and sustainability in secondary education.To support these initiatives, the paper proposes a comprehensive policy framework that promotes healthy food environments, addresses unhealthy food marketing, and fosters collaboration across sectors. Capacity building for educators and appropriate monitoring systems could support effective implementation and accountability. The Discussion Paper outlines strategies to strengthen food and nutrition education in schools in India. It suggests expanding programs like PM POSHAN into a nutrition literacy movement and enhancing initiatives such as the Eat Right School with audits and gamified learning. Curriculum integration is recommended, with age-appropriate food literacy education introduced from early childhood through experiential learning involving gardening and cooking. Schools can promote healthy eating by limiting unhealthy food options and encouraging positive choices through initiatives such as Healthy Canteen Committees.

A multi-sectoral approach involving national ministries, local departments, and parents is important for effective program execution. Engaging parents and utilizing behaviorally informed strategies can improve participation in health initiatives. The paper proposes integrating Indian culinary diversity into education, linking local agriculture to school meals, and leveraging data-driven accountability through digital tools. Overall, it highlights the potential value of coordinated efforts to strengthen school-based nutrition education and support healthier dietary and lifestyle practices among students.

1

FOOD AND NUTRITION EDUCATION- WHY AND WHY NOW?

India faces a complex public health crisis characterized by a triple burden of malnutrition, encompassing undernutrition, overnutrition, and micronutrient deficiencies (Global Nutrition Report, 2020). As per NFHS-5 (2019–21), the percentage of overweight children under five increased from 2.1% in NFHS-4 (2015–16) to 3.4% in NFHS-5 (***Table 1***). While this increase appears modest, it indicates an upward trend in overweight prevalence among children under five. While undernutrition persists (NFHS-3, 2007), overnutrition and obesity are increasing, notably in school-aged children and adolescents; this is due to, higher income levels and the widespread availability of calorie-dense ultra-processed foods.

Table 1: *Trends in Childhood Obesity in India*

Survey Year	Overweight (Children under 5)	Urban (%)	Rural (%)
NFHS-4 (2015–16)	2.1%	Not disaggregated	Not disaggregated
NFHS-5 (2019–21)	3.4%	4.2%	3.3%

Source(s): (IIPS and ICF 2017; IIPS and ICF 2021)

Malnutrition in India occurs within a broader context of lifestyle-related health risks.Research indicates that factors like nutrition, physical activity, sleep, stress, social interactions, and the environment influence health trajectories (Rippe 2024). Increased screen time, sedentary behaviours, irregular eating patterns, and poor sleep quality have been associated with metabolic and psychological health risks among children and adolescents. Thus, the paper proposes broadening food and nutrition education into a more holistic lifestyle education approach that promotes daily practices of movement, rest, mindful eating, emotional balance, and digital discipline.

This epidemiological shift is also evident in the rise of non-communicable diseases (NCDs) like diabetes, hypertension, and cardiovascular disease at younger ages (Gupta *et al,* 2012), with obesity being a significant risk factor for insulin resistance and heart disease. The coexistence of undernutrition, micronutrient deficiencies, and overweight or obesity in India reflects the country's double and triple burden of malnutrition. These patterns occur in the context of economic constraints, exposure to food marketing, increasing availability of ultra-processed foods, and unequal access to affordable nutritious foods. In response, the paper proposes re-conceptualizing food and nutrition education as a broader approach incorporating behaviour change and habit formation.

The social and economic ramifications of these dietary issues are substantial. Childhood obesity is associated with chronic illnesses and negatively impacts mental health, leading to issues such as low self-esteem and depression (WHO, Obesity and overweight, 2025). Undernutrition and associated developmental disadvantages in early childhood can adversely affect cognitive development, educational atta-

i-nment, and later economic productivity (Grantham *et al.,* 2007). Food and nutrition education is one potential intervention for strengthening the knowledge and skills that support healthier food choices and dietary practices.

From a lifestyle medicine perspective, the paper emphasizes childhood as an important period for establishing health-related behaviours that may influence longer-term health risks. Afshin *et al.* (2019) suggests that many adult diseases have their origins in childhood, influenced by established dietary patterns, eating behaviours, and physical activity level. For instance, habits like skipping breakfast, frequent consumption of pre-packaged food products, and reliance on fast food during adolescence are associated with obesity and poor metabolic health in adulthood. Children with obesity are more likely to experience obesity into adulthood (Lobstein *et al.,* 2015), with associated long-term health and economic consequences. India, in particular, contends with the dual challenges of widespread micronutrient deficiencies, such as iron-deficiency anemia affecting school-aged adolescent girls, which leads to fatigue, diminished academic performance, and increased maternal risks, alongside the growing prevalence of obesity (Monterio *et al.,* 2019). Interventions and integrating preventive health based on lifestyle choices within school systems is crucial for both public health and developmental goals, and are most effective when they occur early, as childhood health behaviors are more malleable. Global studies demonstrate that school-based nutrition education programs yield measurable improvements in diet quality, knowledge retention, and reduced intake of unhealthy foods (Casto AM, 2014). Consequently, food and nutrition education is presented as a foundational strategy for promoting lifelong health, breaking cycles of malnutrition, and preventing the onset of Non-Communicable Diseases (NCDs). The paper therefore proposes a stronger focus on "nutrition and healthy habit literacy," emphasizing children's daily practices alongside knowledge.

Schools serve as significant platforms for promoting child nutrition due to the significant amount of time children spend in these environments during their formative years (Sidaner *et al.,* 2013). Integrating nutrition education into the curriculum, through methods like reading food labels and analysis of marketing, has shown to improve dietary habits and reduce junk foodconsumption (Monterio *et al,* 2019). Experiential learning via school gardens, cooking workshops, and nutrition clubs further solidifies healthy practices and encourages peer learning. Additionally, the paper proposes that school-based health promotion incorporates daily wellness practices including hydration, regular meals, outdoor activity, mindfulness, and healthy sleep routines.

School food environments can reinforce nutrition education by increasing the availability of healthier options and aligning canteen practices with applicable standards and regulations. Involving parents and teachers may help improve consistency between nutrition messages provided at school and practices encouraged at home, with educators modelling healthy behaviours and parents participating through activities such as "healthy tiffin weeks."

The growing influence of digital media and online food and health information highlights the relevance of nutrition and digital health literacy, particularly for adolescents exposed to food marketing, fad diets, misinformation, and unrealistic body images. The paper identifies schools as one setting in which students can learn to assess digital content, understand food marketing, and develop healthier digital practices. Addressing dietary myths requires sensitive approaches while promoting evidence-based practices. Parent engagement through various events and materials extends nutrition education into households for long-term sustainability. Policy interventions, such as stricter advertising regulations for ultra-processed foods (UPFs) and public awareness campaigns debunking myths, are also important for creating supportive ecosystems that foster informed decision-making and build important food literacy for future change agents in terms of informed food choices. Overall, the paper positions food and nutrition education as a platform for building practical food and healthy-lifestyle knowledge among children, supported by school environments, teacher engagement, and opportunities for students to apply this learning in everyday life.



Photo Credit: C. Narasimha Reddy (WASSAN)
Ragi pakoda, korra payasam, and ragi laddu prepared by Poshana Vanithas during the recipe training.

2
MATERIALS AND METHODS

This Discussion Paper on school-based food and nutrition education in India was developed through a structured, integrative, and evidence-driven methodology, addressing the complex nutritional challenges that include undernutrition, micronutrient deficiencies, and overnutrition. Its primary purpose was to create a comprehensive framework that synthesizes existing evidence while providing actionable insights relevant to the evolving education and health systems in India.

The methodology began with a systematic document review to assess the current state of school-based nutrition education. This involved an extensive search across academic databases such as PubMed, Scopus, Google Scholar, and IndMed, covering the timeframe from 2010 to 2025. Key search terms included "school nutrition India," "nutrition education programs," and "student dietary behaviour," with a focus on large-scale evaluations, intervention trials, systematic reviews, and studies relevant to South Asia and other low- and middle-income countries (LMICs).

In addition to literature review, an analysis of national and sub-national policy documents was conducted to understand the integration of nutrition education within existing frameworks. This included reviewing operational guidelines from the Ministry of Education, Ministry of Women and Child Development, and Ministry of Health and Family Welfare. Notable initiatives such as the Mid-Day Meal Scheme, the National Education Policy 2020, and POSHAN Abhiyaan implementation plans were examined, which provided insights into institutional priorities, delivery mechanisms, and scope of improvement in policy execution.

Quantitative and qualitative insights were further derived from national datasets, including the National Family Health Survey (NFHS-5), Annual Status of Education Report (ASER), and Comprehensive National Nutrition Survey (CNNS). This analysis took into account disaggregated data to highlight inequities in nutritional access and health outcomes based on gender, location, and socioeconomic status. To broaden the perspective, stakeholder mapping was also performed to identify the various actors involved in school-based nutrition education interventions. Although primarily desk-based, this review included reports and case studies from international agencies like UNICEF and FAO, revealing the roles of stakeholders, including government bodies, school management committees, teachers, parents, and NGOs.

A significant aspect of the methodology was its comparative lens, analyzing international models from countries such as Japan, Brazil, Mexico, Indonesia, Kenya, and Finland. This aimed to draw lessons from diverse approaches, such as curriculum integration and universal meal programs, and assess their contextual relevance for India.

The synthesis of findings included an iterative peer review process to ensure outputs maintained scientific rigor alongside practical relevance. A triangulation method was employed to validate insights across academic literature, policy documents, national datasets, and global case studies, ensuring a comprehensive understanding of the subject matter. Ethical considerations were strictly observed, employing data exclusively from publicly available and peer-reviewed sources without involving primary data collection that might risk confidentiality.

In conclusion, the methodology adopted in this Discussion Paper combined \ literature review, policy analysis, data assessment, stakeholder mapping, and international case studies. This multifaceted approach not only reflects the current evidence regarding school-based nutrition education but also provides a robust foundation for recommendations that align with India's policy landscape and global best practices.



Photo Credit: C. Narasimha Reddy (WASSAN)
Ragi pakoda, korra payasam, and ragi laddu prepared by Poshana Vanithas during the recipe training.

3

WHY SCHOOLS FOR HEALTH AND NUTRITION EDUCATION?

3.1. WHY SCHOOLS MATTER?

Schools are strategically positioned to tackle India's nutrition challenges, as children spend significant formative years within their environments. This setting allows for the reinforcement of healthy behaviors through structured opportunities for education on diets, hygiene, and physical activity (Patton *et al.,* 2016). Studies demonstrate that dietary habits formed in childhood often persist into adulthood (Craigie *et al.,* 2011), highlighting the relevance of early education on nutrition, especially in India, which faces a dual burden of undernutrition and obesity (WHO, School policy framework, 2006).

Integrating nutrition into school curricula equips students with knowledge such as understanding balanced diets and food labelling, thus supporting them as informed consumers and promoting healthy practices within their families and communities (Srivastava and Misra, 2024). Furthermore, supportive school environments that prioritize healthy food choices, limit sugary drinks, and promote physical activities can help reinforce classroom lessons by making healthy choices more accessible (Story *et al.,* 2009).

Globally, school-based interventions have shown effectiveness in enhancing children's dietary habits and selected health indicators (Langford et al., 2014). Nutrition-sensitive interventions in schools can contribute to addressing various forms of malnutrition. For instance, providing nutritious mid-day meals can reduce undernutrition, while integrating lessons in the classroom can help support healthier food choices. The combination of these efforts with physical education programs may also aid in obesity prevention and enhance overall well-being (Sajjan J, 2008).

Looking internationally, initiatives like Japan's Shokuiku and Brazil's National School Feeding Program (PNAE) offer relevant insights. The Shokuiku initiative promotes food education interwoven with cultural food traditions, while the PNAE links local farmers with schools to provide fresh meals, benefiting community livelihoods and diversifying diets (Asakura et al., 2017). Incorporating these methods into education, canteen practices, extracurriculars, and community engagement may provide students with practical and culturally significant nutrition learning.

3.2. EXISTING INDIAN PROGRAMMES AND POLICY

India's education system, comprising around 1.5 million schools and close to 250 million children, presents both challenges and opportunities for nutrition education (UDISE+, 2023–24). Initiatives like the Mid-Day Meal Scheme, FSSAI's Eat Right School, and the Ayushman Bharat Health and Wellness Ambassadors represent existing approaches to school nutrition and health education.

India also has large-scale programmes such as the Mid-Day Meal Scheme, reaching over 118 million children daily before the COVID-19 pandemic (Dreze and Khera, 2017). Policies such as the NEP 2020 emphasize health and well-being in education, presenting an opportunity to strengthen nutrition education within the broader education framework (NEP, 2020).

3.3. IMPLEMENTATION

Scaling up school-based health interventions in India may involve coordinated efforts across various sectors, including education, health, agriculture, and food regulation. Variations in teacher capacity, rural infrastructure, and WASH facilities may affect programme implementation. Targeted investments and capacity-building efforts may support programme effectiveness.

A significant issue is the uneven teacher capacity, with roughly 9.5 million teachers, variations in teacher-student ratios, and limited availability of trained personnel, especially in rural areas, which may hinder effective nutrition education integration. Many rural schools in India have also been reported to face limitations in functional kitchens, adequate food storage, and proper water, sanitation, and hygiene (WASH) facilities, affecting the delivery of mid-day meals and overall health outcomes (Majra and Gur, 2010; Jena S *et al.,* 2022).

Collaboration with parents and local leaders through workshops may extend the impact of nutrition education beyond school and support longer-term healthy behaviors (Runjala and Katta, 2025).

3.4. WHAT THE DISCUSSION PAPER PROPOSES

The paper proposes that schools foster holistic lifestyle habits beyond nutrition by integrating physical activity, sleep routines, stress management, emotional well-being, and digital health into student life. Grade-wise habit milestones, such as regular hydration and age-appropriate physical activity, are proposed to support gradual internalization of healthy behaviors and help students gain comprehensive health literacy rather than limited dietary knowledge.

Behavioural approaches such as healthy canteen menus and gamified habit tracking are also proposed to support classroom lessons and habit formation. Linking existing initiatives to habit-focused interventions may help broaden nutrition programs into holistic lifestyle education platforms.

The paper further proposes utilizing appropriate monitoring approaches, along with teacher-led "Food and Lifestyle Coach" programs and structured parent engagement, to support behavior change. Strategies may also include linking local agricultural producers to school meal systems, with potential benefits for nutrition, local economies, and food-system resilience (Global Panel on Agriculture and Food Systems for Nutrition, 2020).

Schools serve as important settings for habits as well as knowledge. In India, integrating nutrition education with lifestyle skills, behavioral science approaches, teacher engagement, and active community participation may support health literacy and healthier behaviors among children. The paper identifies teacher training, infrastructure, multisectoral partnerships, adequate resources, and monitoring systems as areas that may support the strengthening of school-based nutrition education.

4

PROGRAMMES SUPPORTING NUTRITION EDUCATION: KEY REFLECTIONS

The current focus on school curriculum in India includes largely theoretical nutrition education, it often lacks practical, experiential learning that can influence behavior (Khera R 2019; Saxena S 2020).

4.1. DISCUSSION PAPER DIRECTION

Embedding hands-on nutrition education through activities like school gardens, cooking demonstrations, and hygiene training can equip students with lifelong dietary awareness and decision-making skills. Thus, the future direction for PM POSHAN may extend beyond feeding, toward a multisectoral approach that combines food security with nutrition literacy, empowering children to make informed choices and contributing to long-term public health improvements.

Integration of lifestyle factors like physical activity, sleep, stress management, and digital health behaviours is important for holistic well-being. Nutrition education can be viewed as part of a daily lifestyle ecosystem that connects food choices with overall health, emotional well-being, and preventive health practices.

4.2. POSHAN ABHIYAAN

Relevance for School-Based Nutrition Education

Schools can significantly enhance the educational dimension of the POSHAN Abhiyaan initiative, originally focused on community nutrition improvement.

Integrating POSHAN messages into classroom discussions allows students to connect theoretical knowledge with practical application related to their meals (Nourishing the Nation. Poshan Abhiyan's Holistic Approach to Nutrition and Wellness, 2025).

Proposed School-based Approaches

Schools may establish Poshan Clubs for students to monitor their diets, learn food label reading, and engage in nutrition quizzes, effectively transitioning from theoretical education to practical experiences like community cooking demonstrations.

Further, by implementing school gardens aligned with POSHAN's local food emphasis, students can cultivate vegetables such as spinach and carrots, gaining insights into nutrition while reinforcing healthy eating habits through direct consumption of their harvest linked to Mid-Day Meals (Runjala and Katta, 2025).

Schools can also facilitate anemia screening drives, nutrition events, and workshops, fostering knowledge-sharing among peers and families that extend the program's influence within communities.

4.3. FSSAI'S 'EAT RIGHT SCHOOL INITIATIVE'

Official Programme Scope

The Eat Right School Initiative promotes the integration of nutrition education within schools by fostering safe and healthy food environments. Teachers are encouraged to incorporate this initiative into their science or life-skills classes. Practical classroom actions include interactive activities such as food label reading competitions and workshops led by local food inspectors or dietitians (Eat Right India, 2025).

Relevance for School-Based Nutrition Education

These activities facilitate connections between food safety and nutrition, enhancing engagement and practical understanding of food safety concepts. Practical classroom actions incorporate experiential learning, including preparing healthy meals, taste tests, and gamification to encourage healthy food choices. Engaging parents via digital platforms, cooking challenges, and nutrition awareness campaigns helps maintain these practices at home.

Proposed School-Based Approaches

Schools can create student-led nutrition committees and initiatives like Lunchbox Stars and Water Corners to instill healthy habits.
Additionally, schools can establish nutrition committees comprising students to oversee canteen offerings in terms of variety of food options, encouraging the substitution of unhealthy food with healthier options, thus supporting the initiative's objectives and empowering students to make informed food choices.

For successful implementation, engagement with parents and the community is vital; schools can utilize parents WhatsApp group for sharing tips, promote family cooking challenges, and organize health fairs where students showcase their learnings.

To strengthen actions, schools can regularly assess food environments, implement scorecards for canteens, and recognize "Eat Right Champions." These measures may help embed the Eat Right initiative more consistently within school culture.

4.4. SCHOOL HEALTH AND WELLNESS PROGRAMME UNDER AYUSHMAN BHARAT

Official Programme Scope

The School Health and Wellness Programme aims to provide students with important health and nutrition knowledge by integrating nutrition modules into regular class schedules, rather than offering them as infrequent sessions (MoHFW, SHP, 2025).

Health and Wellness Ambassadors, who are trained teachers, are positioned to deliver health promotion and disease prevention information to students.

The programme also includes practical strategies like weekly iron supplementation, hygiene demonstrations, and menstrual health education.

Regular screenings for conditions like anemia, obesity, and vision problems are also undertaken within the broader school-health framework.

Relevance for School-Based Nutrition Education

Regular screenings for conditions like anemia, obesity, and vision problems can provide a foundation for nutrition counseling, effectively linking health checks with nutrition education, such as teaching the importance of iron-rich foods in preventing anemia (Banerjee *et al.*, 2022).

Health and Wellness Ambassadors can also support lifestyle education in areas such as hydration, physical activity, sleep, stress management, and emotional well-being.

Proposed School-Based Approaches

Health and Wellness Ambassadors may serve as habit guides and motivate students to lead their own nutrition awareness initiatives, including lunchbox surveys, debates on junk food marketing, and anemia-awareness rallies, thereby encouraging student-driven participation.

The programme's practical strategies, including weekly iron supplementation, hygiene demonstrations, and menstrual health education, can be made engaging through storytelling and interactive activities.

To enhance monitoring of nutrition-related interventions and their outcomes, schools can maintain digital health cards for students, which can be tied to district dashboards for accountability and check.

Additionally, students may participate in self-monitoring, recording their daily intake of fruits and vegetables to foster active engagement in their health.

4.5. NATIONAL EDUCATION POLICY 2020 AND CURRICULUM INTEGRATION

The NEP 2020 outlines a comprehensive framework to integrate nutrition literacy within educational curricula across various subjects. The policy promotes skills-based learning which can be achieved through experiential activities like cooking classes, with learning partnerships involving culinary and nutrition experts to enhance practical understanding.

Proposed School-Based Approaches

Building on NEP 2020, empowering students by appointing nutrition ambassadors may be considered for fostering leadership and promoting health-conscious behaviors among peers. Effective integration of nutrition education would also require appropriate teacher training and continuous professional development, supported where relevant by digital resources, and suitable assessment methods. Teachers may be encouraged to create interdisciplinary projects, such as calculation and evaluating the nutritional value of Mid-Day Meals or analyzing regional recipes, thus treating nutrition as a core theme rather than an isolated or alien topic.

4.6. SUGAR BOARD INITIATIVE UNDER SCHOOL HEALTH GUIDELINES

The Central Board of Secondary Education (CBSE, 2025), following a recommendation from the National Commission for Protection of Child Rights (NCPCR), has requestedto establish “Sugar Boards” in all affiliated schools across India to raise awareness about excessive sugar intake and promote healthier food choices. Thesugar boards serve as visual nutrition education tools, offering children important information about recommended daily sugar intake, the sugar content of commonly consumed foods and beverages, and the health risks associated with excessive sugar consumption.

Proposed school-based approaches

Sugar Boards can serve as effective tools in schools to raise awareness about hidden sugars in foods. They can be used by teachers in health classes to connect sugar consumption to health issues such as obesity, diabetes, and dental decay. Students actively engage by bringing snack wrappers to compare sugar content and calculate their daily intake, turning mathematical exercises into interactive nutrition lessons. Canteens can implement a color-coded sticker system to indicate sugar levels in foods, while students may take home sugar awareness charts for discussions with family, promoting consistency in nutrition education between school and home.

Furthermore, the Discussion Paper proposes that schools can establish "Sugar Watch Clubs," encouraging students to create posters, skits, or short videos focused on sugar reduction, which effectively resonates with peers. For long-term impact, integrating Sugar Boards with monitoring systems that track changes in sugary drink sales and lunchbox contents over time is suggested. This update in the approach can incorporate Sugar Boards into daily school routines, fostering a habit-formation ecosystem. 'Sugar Watch Clubs' motivate students to lead campaigns, track sugary drink sales, and monitor lunchbox contents, while teachers serve as behavioral role models to facilitate habit adoption. Recognizing and rewarding progress can foster a sustained commitment to reducing sugar consumption.

Incorporation of Nutrition Education in school

Nutrition education can be integrated throughout the school culture rather than confined to science classes, utilizing platforms like morning assemblies and cultural events, organizing field trips to promote healthy eating messages (WHO, 2021). Combining nutrition education with physical activities, such as sports and yoga, allows students to see the connection between their diet and physical performance, particularly among school athletes who can share experiences about how improved nutrition enhances stamina. Schools can enhance health support through counseling sessions and programs for students, while also checking mid-day snacks to reinforce what's taught in classrooms. Community involvement is key; parent-teacher meetings can feature nutrition demonstrations, encouraging parents to pack balanced meals and share recipes, fostering a consistent message between home and school. Morning assemblies, cultural events, sports, and yoga sessions are utilized to connect diet, performance, and lifestyle habits. Counseling, habit trackers, and community demonstrations promote engagement and consistency between home and school. Incorporating lifestyle medicine principles into school programs establishes a habit-formation framework, supported by teacher empowerment, student initiatives, and parent involvement, fostering sustainable healthy behaviors in children. Additionally, to make nutrition education a permanent part of the educational system, schools can establish structured lesson plans, assessment methods, and partnerships with local health departments, ensuring that nutrition initiatives are sustainable, evaluated, and refined over time.

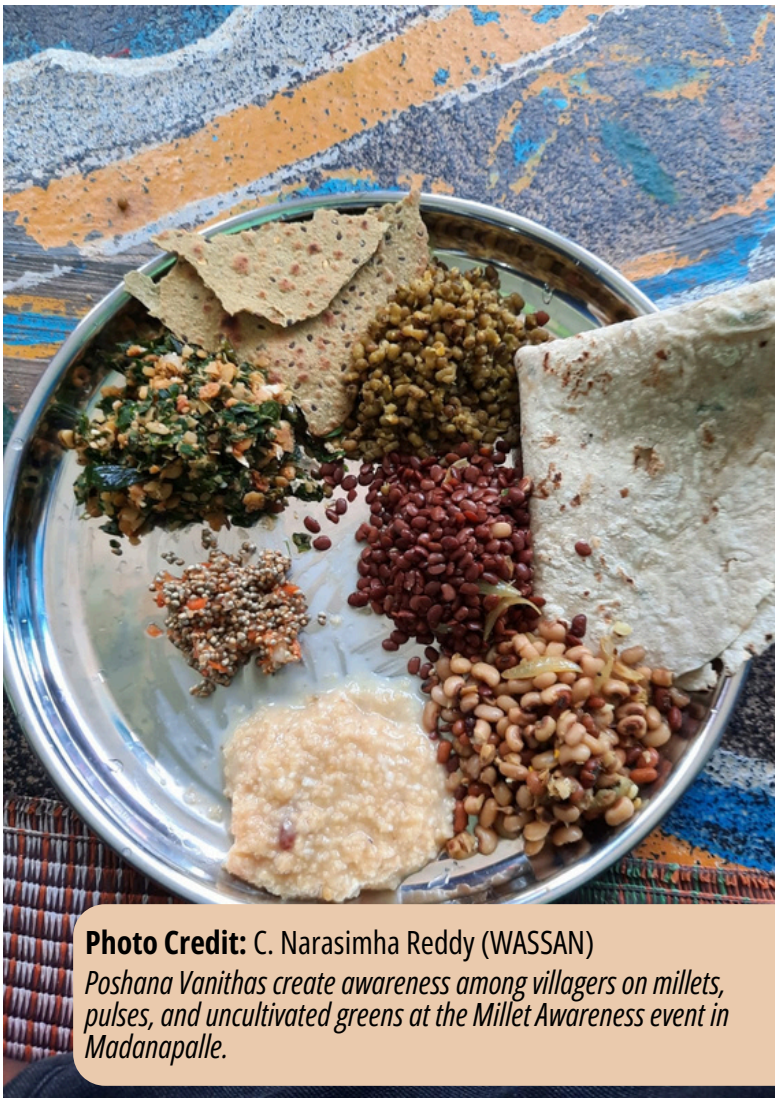


Photo Credit: C. Narasimha Reddy (WASSAN)
Poshana Vanithas create awareness among villagers on millets, pulses, and uncultivated greens at the Millet Awareness event in Madanapalle.

5
GLOBAL CASE STUDIES AND POTENTIAL MODELS FOR FOOD AND NUTRITION

*International case studies provide valuable lessons on how food and nutrition issues are addressed in schools. The case studies are best practice models that have been tried in various countries and showcase creative methods of incorporating nutrition into school curricula and enhancing the school food environment. These initiatives align with lifestyle medicine principles, emphasizing physical activity, sleep, stress management, and digital well-being. By adopting these strategies, India has the potential to create a comprehensive school health ecosystem that combats undernutrition, obesity, and non-communicable diseases. These global examples illustrate the imperative for systemic and coordinated effort, demonstrating the critical value of an integrated approach to advancing the health and nutrition of children globally. India can draw insights fromeffective school-based nutrition initiatives established in several other countries. (**Table 2**)*

5.1. CASE STUDY 1: INDONESIA - MAKAN BERGIZI GRATIS (MBG)



Indonesia's National Free School Meals Program, Makan Bergizi Gratis (MBG), was launched in January 2025 by President Prabowo Subianto, targeting around 19.5 million schoolchildren and pregnant women. With a budget of up to $28 billion, the program focuses on centralized kitchens, local food sourcing, and nutritionist-designed meals to address stunting and enhance educational outcomes. Influenced by Japan's school lunch system, MBG prioritizes food safety and education, receiving technical assistance from the UN, WFP, and UNICEF (UNICEF Indonesia 2025), making it one of the most ambitious school-based nutrition initiatives globally.

Indonesia's MBG (AP News, 2025; Financial Times, 2025) program demonstrates the success of large-scale free school meals in combating stunting and undernutrition. India can enhance the PM POSHAN scheme by offering balanced meals creating habit-focused initiatives. Schools could set up community kitchens managed by women's self-help groups to ensure quality and job creation. Nutritional education could be integrated into the curriculum, encouraging students to monitor their dietary habits.

5.2. CASE STUDY 2: MEXICO - BAN ON JUNK FOODS IN SCHOOLS

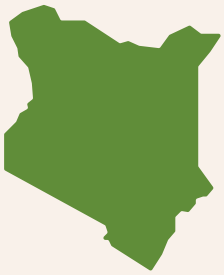


Mexico, one of the first countries to enact comprehensive legislation targeting school food environments, introduced guidelines in 2010 to prohibit the sale and distribution of junk foods in public and private schools (Barquera et al, 2013). The policy aimed to reduce children's exposure to energy dense, nutrient-poor foods and promote healthier dietary habits. Schools were encouraged to offer fruits, vegetables, and potable water as part of the initiative (Secretaría de Salud, 2010).

Mexico's junk food ban highlights the effectiveness of regulatory measures in transforming school food environments. offering relevant insights for school food environments in India. India could consider strengthening school canteen guidelines, supported by clear standards, periodic compliance checks and appropriate enforcement mechanisms.

Establishing "Healthy Canteen Committees" can involve students, teachers, and parents in weekly food reviews to enforce the ban on junk food. Nutrition clubs can promote awareness through initiatives like "Swap Your Snack," where students compete by presenting healthier food alternatives. Additionally, incorporating junk food bans into school nutrition report cards shared with parents can foster healthier eating habits at home, decreasing exposure to ultra-processed foods.

5.3. CASE STUDY 3: KENYA - FOOD4EDUCATION INITIATIVE



In Kenya, the Food4Education initiative has made significant strides in improving school nutrition by providing daily meals to over 300,000 children through locally operated and sourced kitchen networks. This program not only addresses child hunger and malnutrition but also enhances school attendance and academic performance among beneficiaries. With a focus on sustainability and scalability, Food4Education aims to expand its reach to one million children per day by 2027, contributing meaningfully to national education and health outcomes (Food4Education, 2025).

Indian schools may adopt similar practices by connecting local farmers with school kitchens, enhancing nutrition and supporting local agriculture. Additionally, implementing digital payment options like QR codes can promote digital literacy while tracking nutrition. Involving students in documenting local recipes can integrate nutrition into cultural education. This approach promotes farm-to-school systems in India, reduces reliance on packaged food, encourages diverse regional diets and enhances lifestyle literacy and preventive health awareness from early ages.

5.4. CASE STUDY 4: GHANA- SCHOOL FEEDING PROGRAMME



Ghana's School Feeding Programme (GSFP), launched in 2005, aims to provide one hot, nutritious meal daily to all pupils in public kindergartens and primary schools. The program is designed not only to address short-term hunger and improve nutrition but also to increase school enrollment and attendance while stimulating local agricultural production by sourcing food locally (Ghana School Feeding Programme, 2022). The GSFP has significantly improved school participation and created employment opportunities, particularly for women working as caterers. It effectively integrates nutrition improvement with agricultural development through local food sourcing.

India can enhance its school meal programs by fostering direct farm-to-school linkages, engaging farmer cooperatives, and reducing middlemen costs. Teachers can incorporate procurement data into math lessons to teach students about nutrition and economics. Additionally, prioritizing women caterers in school meal programs can enhance nutrition education and women's empowerment. Forming CSR partnerships can promote funding sustainability, while integrating habit-tracking tools in classrooms can help measure outcomes such as water intake, fruit consumption, and daily physical activity.

5.5. CASE STUDY 5: JAPAN - THE SHOKUIKU INITIATIVE FOR FOOD EDUCATION



Japan's Shokuiku program, launched in the early 2000s, aims to promote food education in the curriculum of schools, ensuring children's understanding of the interlinkages between food, health, and sustainability. The program emphasizes the cultural aspects of Japanese cuisine and teaches children the importance of using seasonal foods as well as adopting ecologically sustainable practices.

Shokuiku activities include cooking classes, farming, and market trips, all of which significantly improve children's diets. Higher vegetable and fish intake and lower rates of childhood obesity are significant outcomes (Ishikawa *et al.*, 2017). This program is a prime example of how food education can be successfully implemented in the school setting to promote better diets.

Japan's Shokuiku promotes food education as cultural literacy, highlighting its connection to health and sustainability. Indian schools might implement seasonal food calendars, cooking lessons, and farm visits, enhancing habit formation through tracking daily fruit intake, hydration, and mindful eating. Nutrition festivals could feature traditional recipes, blending cultural identity, lifestyle practices, and preventive health education into the curriculum.

5.6. CASE STUDY 6: BRAZIL - THE NATIONAL SCHOOL FEEDING PROGRAM (PNAE)



Brazil's School Feeding Program (PNAE), launched in 1955, offers free lunch to public school children and promotes the intake of locally produced, organic foods, such as fruits, vegetables, cereals, and legumes. The program targets disadvantaged regions and has the goal of enhancing nutrition and food security.

The PNAE is aligned with Brazil's Zero Hunger Program, aimed at decreasing food insecurity and enhancing living standards among low-income families. Assessments have indicated improved nutritional status and school attendance among children, with over 40 million students being benefited every year (Figueira et al, 2018). In addition, PNAE integrates nutrition education, which empowers children with knowledge regarding healthy consumption and sustainable practices.

India can adapt this model by improving its nutrition education by incorporating it into mid-day meals, promoting habits like portion control, water intake, and mindful eating, while also monitoring and rewarding these behaviors to foster long-term lifestyle literacy.

5.7. CASE STUDY 7: FRANCE - SUSTAINABLE ENVIRONMENTAL PRACTICES AND HEALTHY DIET



France promotes sustainability in nutrition through vegetarian meals, organic sourcing, and food waste reduction. India may introduce "Green Meal Days," monitor food waste, and engage students in generating solutions to enhance nutrition, environmental awareness, and lifestyle habits. Reducing single-use plastics and involving students in sustainability contests can further promote comprehensive healthy practices along with food literacy. Following France's example could enable India to tackle malnutrition and environmental issues concurrently (Nwoko, 2023).

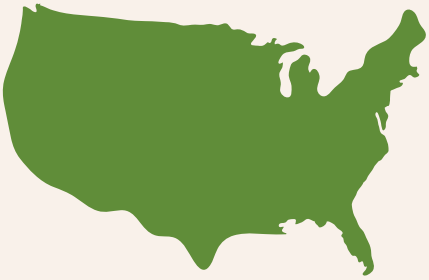
5.8. CASE STUDY 8: SINGAPORE — TRIM AND FIT (TAF) PROGRAM



Despite criticism for possible stigmatisation, the old Trim and Fit (TAF) program effectively decreased schoolchildren's obesity rates through physical activity and nutritional education. In partnership with the Ministry of Education, the "Trim and Fit" initiative aimed to reduce childhood obesity and enhance physical fitness. Water coolers for proper hydration were installed, unhealthy canteen alternatives were restricted, and nutrition education was included in the program. Through physical activity and referrals for further care, overweight students received focused attention. Healthy behaviours at home were promoted by community-based programs. Between 1992 and 2000, students' obesity rates decreased as a result of these initiatives (Toh *et al.*, 2002).

India can adopt and implement personalized counseling, and gamified initiatives such as "10,000 Steps & 5 Fruits a Day." Schools may involve parents via workshops and sports days to encourage healthy lifestyle habits while preventing stigma and body shaming.

5.9. CASE STUDY 9: THE UNITED STATES—THE NATIONAL SCHOOL LUNCH PROGRAM (NSLP)



The United States' National School Lunch Program (NSLP), launched in 1946, is a major initiative aimed at providing healthy meals to children, particularly those who come from economically deprived backgrounds. Since its inception, the program has evolved to include meals that align with set dietary guidelines, focusing on balanced nutrition and improving overall health outcomes.

In 2012, the Healthy, Hunger-Free Kids Act greatly increased the NSLP by raising the consumption of fruits, vegetables, whole grains, and low-fat dairy and lowering sodium, saturated fat, and trans-fat. Although research indicates some nutritional gain, food waste and higher meal cost issues remain (Adams *et al.*, 2017).

Continued program evolution testifies to the challenges of finding a balance between sustainability and the mitigation of children's nutritional deficiencies. However, the program highlights the necessity of national nutrition standards and ongoing reforms to address children's needs. Prioritizing menu appeal and ongoing evaluation will promote acceptance and maintain healthy practices.

5.10. CASE STUDY 10: FINLAND—THE FINNISH SCHOOL MEAL PROGRAM



Finland's School Meal Program is famous globally as being among the most effective school nutrition programs in the world. Rolled out in 1948, the program provides all students in primary and secondary schools with free, healthy meals. The meals are designed specifically to provide the children with their daily nutritional needs and are prepared from fresh, locally available ingredients.

The Finnish program focuses on well-balanced nutrition, with an emphasis on developing healthy eating habits through educational interventions. Schools often integrate food-related activities, including cooking lessons and discussions about the benefits of healthy eating. The success of Finland's program is reflected in the high quality of child nutrition and the low incidence of childhood obesity. In addition, the program is considered a model for providing equal access to healthy food for all students (Konttinen *et al.*, 2015).

India could implement universal meal provision in schools and incorporate nutrition and lifestyle education in classrooms.

5.11. CASE STUDY 11: SOUTH KOREA - THE SCHOOL MEAL PROGRAM (SMP)



The South Korean School Meal Program (SMP), launched in the 1970s, provides each student with a healthy and well-balanced meal each school day. The SMP has seen tremendous growth, involving close to all the schools. The meals aim at enhancing health and cultural heritage by serving traditional Korean food using fresh, locally obtained ingredients.

The School Meal Programme (SMP) may contribute to improved nutritional outcomes and dietary practices. It can also provide opportunities for nutrition education, helping students understand the importance of balanced diets and healthy eating practices.

Empirical studies show the program has contributed to lowering incidences of obesity among children, as well as enhancing nutritional rates across the country (Kim *et al.*, 2019). Overall, the program highlights the importance of traditional, balanced diets in schools.

India can adopt regional cuisine menus, hold school food festivals, incorporate portion size education into STEM, and monitor lifestyle habits including fruit and vegetable consumption, hydration, and physical activity. Teachers can help strengthen cultural identity alongside fostering preventive health literacy. By following this model, India could decrease reliance on ultra-processed foods and strengthen cultural identity.

Table 2: *Global School Feeding Programs*

Country	Program Name	Key Features	Outcomes
India (Ministry of Education, 2018)	PM POSHAN (formerly MDMS)	Provides free lunches to students in government and government-aided schools.	Improved nutritional status and school attendance. Challenges include maintaining meal quality amid rising food costs.
Indonesia	National Free School Meals Program	Aims to provide free meals to over 80 million schoolchildren to combat malnutrition and stunting.	Initial rollout distributed 500,000 meal packs in a year; plans to expand to 82.9 million beneficiaries by 2029.
Mexico	Junk Food Ban in Schools	Prohibits the sale of processed snacks and sugary drinks in schools to combat obesity.	Aims to reduce childhood obesity rates; enforcement challenges include compliance across numerous schools.
Kenya	Food4Education	Provides meals to over 300,000 children daily through locally sourced and operated kitchens.	Improved academic performance and nutrition; plans to reach 1 million children daily by 2027.
Ghana	Ghana School Feeding Programme (GSFP)	Targets all public primary schools and kindergartens to provide meals and boost domestic food production.	Increased school enrollment and employment for caterers; challenges include funding and infrastructure.
Japan	Shokuiku	Shokuiku - comprehensive food and nutrition education with dietitians, law enacted in 2005; Diet and Nutrition Teacher System implemented in 2007	Improved awareness of food, nutrition, and health; preservation of traditional food culture

Country	Program Name	Key Features	Outcomes
Brazil	The National School Feeding Program (PNAE)	National School Feeding Program with nutritionist-led meal planning; Nutritionists mandated by law; Local sourcing from family farms; Ban on processed foods, sugar, and salt	Promoted healthy diets; addressed childhood obesity
France	Sustainability-driven food policy including vegetarian meals and organic sourcing	Policies since 2022; Ban on plastics in school food service approved in 2018, enforced from 2025 onward	Enhanced food sustainability; higher-quality meals; reduced environmental impact; upcoming national compliance by 2025–2028
Singapore	Trim and Fit (TAF) program	Implemented between 1992–2000; Ministry of Education partnership; School and home-based initiatives	Reduced childhood obesity rates; improved student fitness andencouraged healthy behaviors at home
United States	Edible Schoolyard New Orleans (ESYNOLA)	The programme integrates gardening and cooking into curriculum; Targeted at low-income students; Emphasis on emotional well-being and food security	Promoted healthy eating, responsibility, and community ties; supported low-income students; improved food awareness and behavior
South Korea	Universal free school meals	Nutrition teacher system in place; Free meals for elementary students; 4,704 trained educators by 2013; 99.6% student participation	Enhanced nutrition education coverage; improved student health; institutionalized school-based nutrition efforts
Finland	Integrated food education in national curriculum with free nutritious meals	Evolved over 70 years; Covers students from basic to university levels	Promoted food competency and life skills; fostered sustainable eating behaviors; global model for scalable school meal programs.

These programs demonstrate the important role of a robust government commitment, community involvement, and the application of evidence-based, sustainable methods in the successful execution of school feeding initiatives. They highlight the necessity of merging nutrition education with habit formation, physical activity, hydration, sleep patterns, and emotional health, illustrating a comprehensive lifestyle medicine approach. The global examples provided showcase the importance of inclusive, culturally relevant, and school-centric strategies that integrate experiential learning, behavioral nudges, and family participation in nutrition education. By establishing schools as hubs for preventive health and habit development, India has the potential to significantly improve the long-term health literacy, dietary habits, and overall well-being of its future generations.

5.12. LESSONS FROM INTERNATIONAL MODELS: KEY LESSONS FOR ENHANCING SCHOOL BASED NUTRITION PROGRAMS IN INDIA

According to international best practices, different strategic approaches emerge that may be considered for adaptation to address the food and nutrition challenges in India's schools. These are not limited to individual initiatives but can be highlighted as overall, systemic measures:

Incorporating Food and Nutrition Education into School Curriculum

Integrate relevant nutrition education into the curriculum, focusing on healthy eating, food literacy, and sustainability. Emphasize habits like daily fruit and vegetable consumption,

Bridging with Local Food Networks

Promoting partnerships with local farmers and cooperatives to source fresh, seasonal produce supports nutrition goals, stimulates local economies, and encourages sustainable development. Engaging students in farm-to-school activities allows them to trace food from farm to plate, integrating nutrition education with cultural knowledge and lifestyle habits.

Supporting Quality and Variety in Educational Meal Programs

Greater emphasis may be placed on dietary quality alongside calorie adequacy by ensuring foods are varied, nutrient-rich, and culturally suitable. Implement habit-based strategies such as “Eat & Learn” labs during meals, allowing students to practice portion control, explore new fruits and vegetables, and understand dietary balance. Incorporating local eating customs with underutilized food groups like pulses, vegetables, and fruits enhances acceptance, nutritional value, and fosters positive long-term dietary behaviors.

Synthesizing Food Culture and Behavior Change Communication (BCC)

Storytelling, peer education, and culturally relevant media can foster healthy eating habits by incorporating behavioral change principles like cue-routine-reward loops, peer role modeling, and digital gamification tools. Integrating food culture, ethics, and sustainability within school culture promotes mindful eating and supports long-term lifestyle habits.

Strengthening Monitoring and Accountability

Comprehensive monitoring systems may include clear indicators for food quality, sanitation, and student nutrition. Use habit scorecards to track water intake, fruit and vegetable consumption, physical activity, and sleep. Leverage online platforms and community participation for transparency and engagement. Connect monitoring initiatives to teacher training and parental involvement to ensure consistency between school and home.

6
KEY STAKEHOLDERS AND THEIR ROLES- RECOMMENDATIONS

The successful implementation of school nutrition programs requires a well-coordinated, multi-sectoral approach involving a diverse group of stakeholders across different levels. These stakeholders contribute in unique but interlinked ways to support the planning, execution, monitoring, and sustainability of such initiatives. In India, the PM POSHAN scheme (formerly the Mid-Day Meal Scheme) exemplifies a multi-tiered approach involving various entities from national to local levels (Ministry of Education, 2018). Similar integrated stakeholder models are seen globally, highlighting the universal importance of collective action in school-based nutrition interventions.

Table 3: *Key Stakeholders in School Nutrition Programs*

Stakeholder Level	Entity/Role	Responsibilities
National Government	Department of Education	Policy formulation, funding allocation, and program oversight.
State Government	State Education Departments and education boards	Implementation of programs, monitoring, and evaluation at the state level.
Local Government	District and Block Education Offices	Day-to-day management, supervision of meal preparation, and ensuring quality standards.
Schools	Principals and Teachers	Overseeing meal distribution, maintaining hygiene, and educating students on nutrition.
Community	School Management Committees (SMCs)	Engaging parents, monitoring program effectiveness, and providing feedback.
Non-Governmental Organizations (NGOs)	Various NGOs	Supplementing government efforts through capacity building, awareness campaigns, and resource mobilization.
International Organizations	UNICEF, WFP, etc.	Providing technical assistance, funding, and sharing best practices.

In India, the Ministry of Education leads PM POSHAN, framing operational guidelines and providing funding to states. These funds and guidelines are further localized by State Education Departments, who are tasked with tailoring the scheme based on regional food preferences, resource availability, and implementation capacities. At the grassroots level, District and Block Education Officers supervise on-ground execution, including vendor management, quality assurance, and grievance redressal.

Schools act as the primary sites of implementation. Teachers and principals are responsible not only for supervising food distribution and maintaining hygienic standards, but also for integrating nutrition-related themes into academic lessons. They play a pivotal role in fostering food literacy among students. Schools may support meal hygiene through safe distribution practices

and operational checklists. Teachers act as 'habit guides' by demonstrating healthy routines in nutrition, physical activity, sleep, and emotional well-being. Practical activities like nutrition tracking and cooking clubs help establish these habits, while student engagement through challenges and events like nutrition fairs promotes preventive health behaviors. Parent engagement includes workshops to discuss balanced meals, fostering continuity between school and home. Feedback mechanisms, like suggestion boxes, empower students to influence nutrition programs.

School Management Committees (SMCs) and community members play a crucial role in oversight and accountability. The authors recommend that SMCs could support monitoring the adoption of healthy habits, the quality of meals, and ensuring transparency. They could also work in conjunction with teachers to weave nutrition and lifestyle education into community-based activities. Additionally, SMCs could promote sustained behavior change by engaging families in health awareness initiatives.

Non-governmental organizations (NGOs) add value by bridging gaps in government service delivery. Their role may include conducting nutrition training for school staff, promoting improved dietary practices, and contributing to the development of educational materials. They could also help generate evidence and provide feedback.

International agencies such as UNICEF and the World Food Programme (WFP) offer strategic and technical guidance, funding support, and opportunities to learn from successful models globally. These agencies often work closely with governments to scale innovations, evaluate outcomes, and address systemic challenges in school nutrition programming. They could embed habit-formation frameworks, and lifestyle literacy modules.

Globally, the multi-stakeholder approach is seen in programs like Kenya's Home-Grown School Feeding Program, which integrates national government oversight with local agricultural support, community mobilization, and international partnerships. Such integration helps promote sustainability, stimulate local economies, and improve nutritional outcomes.

A robust and well-coordinated stakeholder ecosystem forms the backbone of successful school nutrition programs. Achieving improved nutritional outcomes for children requires a multifaceted approach that engages a wide range of actors. Schools implement programmes that incorporate healthy habits related to nutrition and mental well-being, while healthcare providers offer expertise in assessing needs and providing counselling. Parents and caregivers may reinforce these initiatives at home. Such collaboration can support the effectiveness, sustainability, and practical application of child health programmes.

7

DEMAND-SIDE INTERVENTIONS: BEHAVIOURAL AND EDUCATIONAL APPROACHES

Table 4: *Demand-Side Interventions in School Nutrition Programs*

Intervention Type	Description	Indian Context	Global Examples
School-Based Food and Nutrition Education (Shimray, 2023; Saeki, 2024)	Integrating nutrition topics into school curricula to teach balanced diets and sustainable choices.	Emphasis on food literacy and label reading in NCF.	Japan's comprehensive nutrition education programs.
Parental and Community Engagement (Guha, 2023; Castro et al, 2013)	Involving parents and communities in nutrition education through events and workshops.	Utilization of SMCs for parental involvement.	U.S. community gardens and parental workshops.
Experiential Learning (Nagina *et al.*, 2025; Lai-Yeung, 2015)	Hands-on cooking and tasting activities to reinforce nutrition knowledge.	Incorporation of local recipes in school programs.	UK's "Let's Get Cooking" initiative.
Behavioral Nudges (Wyse *et al.*, 2021; Just and Wansink, 2009)	Modifying cafeteria environments to promote healthier food choices.	Implementation of low-cost interventions in school canteens.	U.S. Smarter Lunchrooms Movement.
Digital and Media-Based Campaigns (Montgomery and Chester, 2009; Schoeppe *et al.*, 2016)	Using apps and social media to disseminate nutrition information.	Development of mobile applications targeting adolescents.	Global app based interventions improving dietary behaviors.

7.1. SCHOOL-BASED FOOD AND NUTRITION EDUCATION

Integrating food and nutrition education into school curricula is important for equipping children with knowledge about healthy eating, balanced diets, and sustainable food systems (Contento, 2011). In India, structured lessons based on the National Curriculum Framework (NCF) can promote food literacy, dietary diversity, and local food systems through regular classroom modules focused on the health impacts of dietary choices. Curricula may incorporate habit formation aligned with lifestyle medicine principles, connecting food choices to daily routines, hydration, sleep, and physical activity. Teachers can support this by facilitating goal-setting and reflection exercises.

To build practical skills, schools can implement “nutrition labs” that allow students to read food labels, understand macronutrients, and compare nutrient values of packaged foods,

fostering critical thinking about daily dietary decisions (Moore *et al.,* 2018). Furthermore, connecting food literacy to sustainability involves educating children about the environmental and cultural aspects of food, including seasonal sourcing and waste reduction. School gardens and composting initiatives are associated with specific habit milestones and help cultivate environmentally conscious habits, including daily vegetable consumption, water intake, and involvement in waste reduction efforts (FAO, 2020).

Experiential learning plays a significant role, where schools can integrate hands-on experiences like cooking classes and taste-testing sessions. Regional initiatives that explore traditional foods not only promote balanced diets but also help in preserving cultural knowledge (Kurotani and Shinsugi, 2019). Lastly, it is crucial that nutrition education is not conducted in isolation but is part of a holistic health approach that aligns with physical activity, hygiene, and mental well-being initiatives, as emphasized in the Health Promoting Schools framework (WHO, 2022). In other words, nutrition education can be part of a comprehensive school wellness framework, incorporating mental health, physical activity, and sleep hygiene, with teachers and Health & Wellness Ambassadors serving as role models and facilitators. This comprehensive strategy can help children make informed lifestyle choices that encompass more than just food.

7.2. PARENTAL AND COMMUNITY ENGAGEMENT

Parents significantly influence children's eating behaviors at home, necessitating schools to provide workshops on healthy meal planning, portion sizes, and reducing ultra-processed food reliance (Birch and Ventura, 2009). Engaging parents through community events like nutrition fairs and cooking competitions fosters accountability and a supportive environment for children's dietary habits (Hawkes *et al.*, 2015). Indian schools can institutionalize parental involvement through School Management Committees (SMCs), enabling them to monitor meal quality and influence menu planning according to local cultural practices (NCERT, 2022). Structured family engagement initiatives support habit formation at home and align with school programs. Collaborations with local farmers, NGOs, and health professionals can enhance food access and nutrition knowledge, as demonstrated by U.S. school gardens that encourage parental workshops and increase vegetable intake (Morries *et al.*, 2002). Sustained, structured engagement between schools and families or caregivers fosters a shared culture of healthy eating, promoting long-term adherence to dietary guidelines and reducing dependence on ultra-processed foods.

7.3. EXPERIENTIAL LEARNING

Experiential learning in the context of nutrition encompasses several key strategies aimed at enhancing students culinary skills and healthy eating habits. Practical cooking lessons enable students to transform classroom knowledge into action by preparing nutritious meals with locally sourced ingredients, promoting self-sufficiency and confidence in the kitchen (Perez-Rodrigo and Aranceta, 2001). Taste education plays a vital role by allowing children to sample a variety of fruits, vegetables, and grains in a non-pressured setting, which, along with peer support, can significantly improve their acceptance of healthy foods and contribute to sustainable dietary habits (Wardle *et al.*, 2003). Additionally, students are encouraged to ext-

end their culinary skills to home cooking, which can positively affect family eating patterns through shared recipes and knowledge. Emphasizing traditional Indian recipes and seasonal ingredients in experiential learning fosters cultural relevance, enhances student engagement, and helps preserve intergenerational food knowledge. Encouraging students to log cooking and tasting activities can help track their fruit, vegetable, and water intake, promoting family-wide behavioral change through home cooking integration. Furthermore, cooking and tasting activities are integrated with broader learning goals in subjects such as science, math, and social studies, in terms of nutrient content, portion sizes and food systems reinforcing nutrition literacy as an important life skill and promoting interdisciplinary learning.

7.4. SCHOOL FOOD ENVIRONMENTS AND BEHAVIOURAL NUDGES

Behavioral nudges in school food environments leverage subtle changes to promote healthier eating habits among students. The layout of the cafeteria plays a significant role, for instance, positioning fruits and vegetables in the form of healthy salad options at eye level or near checkout areas can boost their selection rates (Wansik, 2013). Additionally, the presentation of food through appealing signage and labels such as naming carrots “brain boosters” or leafy greens “energy greens” can positively influence students' choices with the unique names. Portion control is another effective strategy, where schools might provide smaller servings of high-calorie items next to readily accessible healthy options, facilitating self-regulation of food intake among the students. Furthermore, peer influence is harnessed through healthy eating or nutrition clubs and initiatives, where students modeling good habits can inspire others. Finally, nudges can be incorporated into a behavioral framework that includes cue-routine-reward cycles and habit scorecards. These components can support students in monitoring their hydration, fruit consumption, and meal diversity, while regular feedback from students and teachers can support cultural relevance and habit sustainability. Overall, these strategies aim to foster a supportive environment conducive to healthy eating behaviors.

7.5. DIGITAL AND MEDIA-BASED NUTRITION AWARENESS CAMPAIGNS

Digital and media-based nutrition awareness campaigns utilize various tools to educate students about healthy eating. Mobile applications engage users by teaching portion sizes, food groups, and nutrient content through gamification, such as rewards for completing challenges (Harris et al, 2009). Social media platforms like Instagram, YouTube, and TikTok effectively communicate tailored nutrition messages for adolescents using short, culturally relevant videos that address healthy snack options and myths about processed foods. Teachers can enhance student learning by integrating app-based nutrition tracking with classroom discussions, allowing students to log their meals and compare them against dietary guidelines, fostering self-monitoring. Furthermore, digital platforms can complement school-based nutrition education through reminders, educational content and family engagement. Content can be adapted to local contexts, including seasonal foods, local dietary practices and affordable recipes.

8

ROLE OF SCHOOL-BASED FOOD AND NUTRITION EDUCATION

8.1. KEY COMPONENTS OF EFFECTIVE NUTRITION EDUCATION

To maximize effectiveness, school food and nutrition education may adopt a holistic approach focusing on habit formation, which includes not just diet but also physical activity, sleep, stress management, and digital health behaviors. Age-appropriate, interactive curricula may address food, health, culture, sustainability, and broader lifestyle habits, enabling students to develop lifelong healthy practices. By integrating nutrition into daily routines and life-course outcomes, schools can promote habit literacy, ensuring students learn practical and actionable behaviors rather than merely acquiring knowledge.

8.2. LAYING THE FOUNDATION

Establishing healthy eating and lifestyle habits in childhood is vital for long-term health. Schools play a key role by teaching students to connect food choices with physical activity, rest, emotional regulation, and hydration. By incorporating nutrition education across various subjects and grade levels, schools can foster lifelong habits, encourage cultural appreciation, and help students navigate complex food environments. Collaborating with initiatives like Ayushman Bharat's Wellness Ambassadors can enhance the relationship between school learning and community health, promoting holistic lifestyle literacy.

8.3. DEVELOPMENTALLY APPROPRIATE CURRICULUM FROM EARLY CHILDHOOD THROUGH SECONDARY SCHOOL

A staged, age-sensitive nutrition curriculum is vital for helping children develop from basic food awareness to informed health and sustainability decisions. In early childhood, playful techniques like songs and storytelling foster positive connections with nutritious foods (Aldinger and Joner, 1998). As children enter primary school, emphasis may focus on learning about macronutrients, portion sizes, and dietary diversity. In India, this could be aligned with the Poshan Maah campaigns under POSHAN Abhiyaan, by encouraging tracking fruit and vegetable intake through classroom activities, enhancing children's understanding of diet quality and encouraging accountability in food choices and lifestyle habits (Ministry of Women and Child Development, 2025). Middle school education may introduce skills such as meal planning and recognizing food marketing, empowering students to analyze packaged snack labels, understand the health consequences of high sugar, salt, and fat (Swinburn et al, 2019) and incorporating behavioural nudges and cues–routine reward frameworks. By secondary school, the focus expands to the public health implications of nutrition, connecting dietary habits to non-communicable diseases and climate change, in line with NEP 2020's Health and Physical Education framework (Ministry of

Education, 2020). Internationally, Japan's Shokuiku program exemplifies a successful model, starting food education in kindergarten and progressing to sustainability and food system literacy in high school, a method that India can use to develop a unified life course strategy. Adopting a similar progressive model in India can ensure continuous nutrition education throughout developmental stages, rather than treating it as a one-time event (Miyoshi *et al.*, 2012).

8.4. EMPHASIS ON FOOD CULTURE AND SUSTAINABILITY

Food education can encompass cultural identity and sustainability, in addition to health. India's varied food traditions, such as millets in Karnataka and fermented foods in the Northeast, provide a platform to instill cultural pride in school curricula (Ankita and Seth, 2025; Downs et al, 2022). Initiatives like "local food weeks" can engage children by showcasing traditional recipes, thus linking them to their heritage (Das et al, 2024; Anitha et al, 2019). Sustainability education may involve practical activities, such as completing waste audits of school meals to identify food waste, environment impact analysis and suggesting solutions, which could be supported by local NGOs promoting both nutrition literacy and ecological responsibility. Lessons may also address the environmental impact of processed foods versus local produce, using classroom experiments to demonstrate sustainability in terms of reducing the carbon footprint (FAO and WHO, 2019). Emphasizing local, seasonal foods can be achieved by partnering with local farmers to provide fresh produce, enhancing experiential learning about food systems. Internationally, Brazil's school feeding program, which requires sourcing 30% of food from local farms, serves as a model for integrating nutrition and sustainability into education policy (Schneider *et al.*, 2010) and this approach may offer relevant lessons for India by connecting Mid-Day Meal procurement to local agriculture.

8.5. SKILL-BUILDING ACTIVITIES

Incorporating practical skills into school-based food and nutrition education is important for enabling students to make informed and healthier food choices in their everyday lives. Beyond theoretical knowledge, students may benefit from developing actionable competencies that can help them navigate the modern food environment effectively. These include meal planning, label reading, and the ability to discern misleading marketing messages related to food.

(a). Meal Planning Skills: Teaching children to plan meals promotes greater autonomy and encourages them to make healthier choices. To implement this, schools can establish weekly "menu labs," wherein students are tasked with creating balanced meal plans that adhere to dietary guidelines and utilize locally available food options as highlighted by the ICMR-NIN (2024). These proposed meal plans can be evaluated against the actual mid-day meals served, thus reinforcing key lessons related to nutrition and the practical aspects of meal preparation. Adoption of habits can be reinforced by integrating this with micro-behavioural nudges, such as Water Corners and Lunchbox Stars.

(b). Reading Food Labels: Learning to read food labels is an important aspect of food literacy. Students may benefit from developing the ability to interpret the nutritional content of packaged foods, including calories, sugar, salt, and fat levels. They may also learn to

read ingredient lists and assess marketing claims such as "low-fat," "sugar-free," or "100% natural," which may not necessarily indicate a healthier product. These skills can support critical thinking and more informed food choices.

(c). Identifying Deceptive Marketing

Kids are frequently subjected to food advertising with regard to unhealthy foods, most notably junk foods and soft drinks. Educating students to be able to identify deceptive marketing strategies, like overreaching health claims or child directed marketing, is important and may help students to make healthier food choices. By learning potential thinking, students can become more sophisticated consumers who are resistant to misleading food advertising.

School-based nutrition and food education is important in influencing children's eating habits, ensuring lifelong health, and building educated consumers. In order to support long-lasting behavior change, teachers who have received training as Food and Lifestyle Coaches serve as role models and use gamification, reinforcement, and parent involvement. Through the incorporation of nutrition education into the school curriculum, schools can equip students with the information, skills, and values that support appropriate food choices and positive attitudes toward nutrition.

With an effective and age-inclusive curriculum that integrates active learning, cultural competence, sustainability, and life skills, schools can equip students with the ability to control their health and well-being. In the end, food and nutrition education in schools is an important intervention for enhancing public health and averting nutrition-related illnesses, both today and in the future.

8.6. SCHOOL-BASED NUTRITION EDUCATION AS A PUBLIC HEALTH STRATEGY

Effective school-based nutrition programs extend their impact beyond the educational setting into homes and communities, as children sharing their nutrition knowledge with parents can positively influence family food practices (Contento, 2011). These programs also play an important role in mitigating health disparities by providing low-income children with equal access to important nutritional information, especially in government schools, addressing both undernutrition and obesity concerns (UNICEF, 2019). Schools serve as a strategic platform to tackle India's triple burden of malnutrition, for instance, addressing iron-deficiency anemia in adolescents not only through supplementation but also via curriculum-enhanced awareness of iron-rich foods and absorption enhancers like vitamin C rich food sources. This reinforces a comprehensive lifestyle medicine approach. Aligning nutrition education with national initiatives, such as the Fit India Movement and POSHAN Abhiyaa may enhance policy coherence and boosts program visibility, thereby integrating educational efforts into wider public health strategies

Thus, schools can be recognized as preventive health institutions, contributing to long-term reductions in healthcare costs by fostering lifelong nutrition literacy (Swinburn *et al.*, 2019).

Table 5: *Comparative Overview of School-Based Nutrition Education Components*

Component	Description	Indian Context	Global Examples
Age-Appropriate Curriculum	Tailored nutrition education that evolves with student age and comprehension	Emphasis on balanced diets and local foods in the National Curriculum Framework	Japan's "Shokuiku" program integrates nutrition education across all grades
Food Culture and Sustainability	Lessons on traditional diets, local cuisines, and sustainable practices	Inclusion of regional food practices and environmental impact discussions	Brazil's school feeding program emphasizes local food systems and sustainability
Skill-Building Activities	Practical exercises in meal planning, label reading, and critical thinking	Implementation of school gardens and cooking classes in various states	The UK's "Let's Get Cooking" initiative promotes hands-on cooking experiences

In India, the integration of nutrition education into the school curriculum has been recognized as a vital strategy for improving public health outcomes. Programs like the Mid-Day Meal Scheme not only provide nutritious meals but also serve as platforms for educating students about healthy eating practices (Ministry of Education, 2018). By adopting comprehensive, culturally sensitive, and practical nutrition education programs, schools can play a transformative role in shaping the dietary behaviors of future generations (Hamed kandil, 2022).

8.7. BUILDING LIFELONG HEALTHY EATING HABITS

School-based nutrition education plays a pivotal role in setting lifelong dietary patterns. As eating behaviours formed in childhood often persist into adulthood, early nutrition literacy may help reduce risks of obesity, diabetes, and other chronic diseases (Story et al, 2009). Children exposed to education about healthy food groups, benefits of fruits and vegetables, and risks of sugar-rich, ultra-processed foods are more likely to sustain these habits. Incorporating physical activity, rest routines, and emotional wellness alongside nutrition reinforces the habit eco-system, highlighting the preventive health focus of lifestyle medicine. Furthermore, the influence extends beyond the classroom. Children often share what they learn with their families, creating ripple effects that foster healthier households and communities (Contento, 2007).

8.8. INTERDISCIPLINARY LEARNING THROUGH NUTRITION

Food and nutrition education is a great way to connect learning across different subjects. Nutrition is interdisciplinary by nature and relates to subjects like science, social studies, mathematics, and even environmental studies. For example, learning about the digestive system, the function of nutrients, and metabolism directly relates to science curricula. Food sustainability and environmental education lessons relate to social studies and environmental education. Not only does this interdisciplinary approach make learning more interesting for students, but it also enables them to see the larger picture in which food and nutrition contribute to society and the environment (Drewnoski and Darwan, 2005).

In addition, education on food systems and agricultural production can relate to social studies, giving students an understanding of how production, distribution, and consumption of food are influenced by economic, political, and cultural conditions. Students can also learn about the cultural and historical meaning of food in societies, which can give them an appreciation for varied food traditions. For instance, kids can learn about the traditional foods of different regions and how they play a role in cultural identity, which leads to respect and appreciation of different cultures.

By incorporating nutrition education into other subjects, schools enable students to see the importance of food and nutrition in their daily lives and provide them with the means to make informed choices regarding food, sustainability, and public health (WHO, 2021). Embedding habit-based learning, and experiential projects, enables students to cultivate cognitive and practical skills for informed lifestyle choices.

8.9. EMPOWERS INFORMED CONSUMERS WHO MAKE HEALTHIER FOOD CHOICES

Modern food systems pose challenges due to widespread marketing of unhealthy food choices. Nutrition education helps students critically evaluate food advertising and misleading packaging. It teaches them how to read nutrition labels, understand ingredient lists, and distinguish between marketing gimmicks and actual health benefits (Nabors et al, 2008). Beyond identifying nutritious foods, students learn why food choices matter, linking nutrition with physical and mental health, disease prevention, and long-term wellness (World Cancer Research Fund, 2018).

Such education creates health-literate and empowered consumers who can make informed decisions to promote preventive health and community well-being.

9

POLICY RECOMMENDATIONS AND WAY FORWARD

India stands at a significant public health challengewhere the triple burden of malnutrition, undernutrition and obesity is affecting children across diverse socioeconomic strata. As per NFHS-5 (2019–21), 35.5% of children under five were stunted, 19.3% wasted, and 7.7% overweight, highlighting a paradox that demands urgent public health intervention. While nutrition-specific programs have made progress in addressing hunger and micronutrient deficiencies, there is a growing consensus that education-based interventions are the missing link in transforming long-term dietary behavior.

9.1. REINFORCING THE URGENCY: THE NEED FOR AN EDUCATIONAL PIVOT

To The challenge of tackling obesity and undernutrition simultaneously may benefit from approaches that address food perceptions and choices. While nutrition-specific programs address micronutrient deficiencies, they may be insufficient on their own for long-term dietary changes. Integrating lifestyle education on diet, physical activity, sleep, stress management, and digital well-being into school curricula is vital for fostering healthy habits from early childhood. Children today are increasingly exposed to ultra-processed foods, sugar-sweetened beverages, and sedentary digital lifestyles, which may not be fully addressedby existing public health strategies. Thus integrating nutrition education into school curricula is important to address childhood obesity in India, as traditional food interventions are insufficient. Successful models from countries like Japan and Brazil show that structured food literacy programs can significantly reduce obesity rates. Schools can influence children's dietary habits through interdisciplinary approaches that incorporate nutrition education into various subjects. Engaging activities such as cooking classes and gardening can reinforce knowledge and foster healthy habits while connecting students to cultural food practices. Developing age-appropriate curricula in collaboration with the government with organizations like UNICEF and FAO, along with teacher training, can support effective implementation . This comprehensive approach can improve dietary choices and health outcomes for future generations in India.

9.2. MAKING HEALTH AND NUTRITION EDUCATION STRUCTURED AND INTEGRATED IN THE CURRICULUM

To maximize the impact of nutrition education, it can be formally incorporated into school curricula, as suggested by India's NEP 2020. Curricula can follow a developmental progression, starting with primary students learning basic nutrition and healthy habits, middle school students focusing on food labels and mindful consumption, and secondary students examining advanced concepts like chronic disease prevention and emotional influences on dietary choices. Teacher training is vital, emphasizing ongoing professional dev-

elopment and hands-on teaching methods. Integration with national programs, such as FSSAI's Eat Right School, enhances practical application of lessons. Continuous evaluation through assessments and digital tools can support for adapting curriculum based on student needs. A 2022 report by UNICEF recommends that nutrition education be made a core component of health and physical education subjects, with appropriate teacher training and material support (UNICEF, 2022). Embedding indicators of habit formation, such as hydration, fruit intake, physical activity, and sleep routines, promotes a transition from knowledge acquisition to measurable lifestyle practices.

9.3. MULTI-STAKEHOLDER COLLABORATION: A WHOLE-OF-SOCIETY APPROACH

To support nutrition education and healthy habits, government agencies, including education and health departments, may benefit from greater coordination on policy alignment and resource sharing.

School staff play a crucial role in this, supported by parents and the community through workshops and events. The private sector can aid schools by reformulating products and sponsoring programs. Effective intersectoral accountability and coordination across all stakeholders are necessary to ensure the success of these initiatives. For sustainable impact, nutrition education cannot be the sole responsibility of schools. Effective delivery and continuity require collaborative governance involving government bodies, schools, parents, the food industry, NGOs, and health professionals.

The POSHAN Abhiyaan, FSSAI's Eat Right School Program, and Mid-Day Meal Scheme (now PM POSHAN) offer platforms for convergence. However, their success hinges on localized implementation, incentives for compliance, and inter-sectoral accountability mechanisms. Hence, teachers, parents, school staff, and community organizations facilitate habit formation, while the private table sector contributes through ethical product reformulation and sponsorships. National and state advisory committees may support policy implementation by providing oversight and guidance, including consideration of relevant lifestyle medicine principles. Programmes such as POSHAN Abhiyaan and PM POSHAN may provide platforms for strengthening inter-sectoral coordination, and approaches that support healthy habit formation.

Table 6: *Suggested Roles of Key Stakeholders in Policy Implementation*

Stakeholder	Recommended Actions
Department of Education	Mandate the inclusion of food literacy in the national curriculum; integrate with NEP 2020.
Ministry of Health & Family Welfare	Link school health check-ups with nutrition interventions and screening.
State Governments	Allocate budget for nutrition educators and content development.
FSSAI and MoWCD	Provide technical guidelines, educational tools, and compliance mechanisms.
Schools and Teachers	Deliver curriculum, monitor dietary behaviors, and engage parents.
Parents and Community	Reinforce healthy habits at home; participate in school nutrition events.
Private Sector and Food Industry	Reformulate products for schools; promote ethical marketing; sponsor campaigns.

9.4. OPERATIONAL ROADMAP FOR IMPLEMENTATION

A structured implementation strategy is important for embedding nutrition education into the school system effectively and sustainably. The paper proposes consideration of a comprehensive national policy on food and nutrition education. Such a policy may include defined objectives, implementation responsibilities across ministries and departments, and measurable outcome indicators to assess progress (WHO, 2021). The roadmap may also outline grade-specific milestones related to healthy habits, including hydration, balanced meals, rest, and physical activity, alongside broader nutrition and lifestyle education.

Secondly, adequate financial support is important. Allocating a dedicated portion of school health budgets, as well as mobilizing Corporate Social Responsibility (CSR) funds, may support the development and distribution of high-quality educational materials, enhancement of school infrastructure, and capacity-building of teachers and staff (World Bank, 2021), ensuring they receive training on how to create habits rather than just impart knowledge.

9.5. POLICY RECOMMENDATIONS TO TACKLE THE DUAL BURDEN OF CHILDHOOD OBESITY AND MALNUTRITION IN SCHOOLS

Addressing the dual burden of obesity and malnutrition among school-age children may benefit from a comprehensive, evidence-informed, and system-wide approach. A holistic, life-course approach can integrate nutrition education with lifestyle literacy encompassing physical activity, sleep hygiene, stress management, and digital health behaviours. The following policy actions are proposed:

9.6. INSTITUTIONALIZE FOOD AND NUTRITION EDUCATION

Integrating structured food and nutrition education into school curricula at all level primary, middle, and secondary is important for instilling lifelong healthy habits. Curricula may connect to practical habit formation by including hands-on activities such as meal planning, cooking, reading food labels, and evaluating misleading advertisements, while also applying behavioral science principles to support habit adoption. This integration may be considered across the country to support consistent, age-appropriate nutrition education throughout the academic journey.

To ensure the content is effective and globally relevant, curricula maydraw from international models such as the WHO's School Health Programs and FAO's Nutrition Education frameworks. At the same time, they can reflect India's regional food diversity and cultural traditions, making lessons relatable and meaningful to students from different backgrounds.

Beyond theory, students can be equipped with everyday skills that support healthier food choices. Modules can include practical activities on meal planning, reading food labels, identifying misleading advertisements, and basic cooking. They can also include "Eat & Learn" sessions, habit nudges such as Water Corners and Lunchbox Stars, along with digital tools to track nutrition and lifestyle behaviours, supporting the adoption of practical habits. Such hands-on experiences can enhance food literacy and encourage responsible lifestyle behaviour.

9.7. CREATE SUPPORTIVE FOOD ENVIRONMENTS IN SCHOOLS

The school setting can reinforce what children learn about nutrition by supporting the availability of healthy food options. Regulations on the sale and marketing of foods high in fat, sugar and salt (HFSS) and sugary beverages in and around schools can help create a healthier food environment. These measures may reduce students' exposure to less healthy food choices.

Additionally, nationally consistent guidelines for school canteens may be considered. Efforts may focus on promoting nutritious and affordable meals, integrating FSSAI's 'Eat Right School' framework, and using behavioural design features such as Healthy Canteen Committees and nutrition competitions to encourage healthier food choices. When nutritious food is both accessible and appealing, children may be more likely to develop healthier eating habits.

Introducing clear front-of-pack labelling and nutrition profiling in school canteens can help children make informed choices. These systems teach students how to interpret food labels, encouraging smarter consumption from an early age.

9.8. PRIORITIZE EQUITY AND INCLUSION

To ensure that no child is left behind, nutrition education may address existing disparities. Tailored programs can be developed for children from marginalized communities and socio-economically disadvantaged groups. These programs can help close the gap in knowledge and access to nutrition.

Support may also be provided through school-based services such as mid-day meals and targeted micronutrient supplementation. Such interventions can contribute to the health and development of children who may otherwise have limited access to adequate nutrition at home. In settings with limited resources, equity-focused efforts may also include inclusive opportunities for practical and habit-building activities.

9.9. STRENGTHEN MULTI-SECTORAL COLLABORATION

Nutrition education does not function in isolation and benefits from coordinated efforts across multiple sectors. Ministries such as Health and Family Welfare, Education, Women and Child Development, and Agriculture, alongside agencies like the Food Safety and Standards Authority of India (FSSAI), can operate under a unified vision. Joint planning, policy coherence, and shared accountability frameworks can strengthen implementation and scale-up of nutrition interventions in schools.

The Government of India's National Multisectoral Action Plan for the Prevention and Control of Common Non-Communicable Diseases (2017) reinforces the importance of integrated action across sectors to address non-communicable diseases (NCDs), including diet-related issues. The Ministry of Health and Family Welfare (MoHFW) can support continued implementation of the National Multisectoral Action Plan (NMAP), contributing to progress toward national targets and healthier outcomes related to obesity and other non-communicable diseases.

Moreover, the operational guidance under the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS, Ministry of Health and Family Welfare, 2023) may be reviewed and realigned to emphasize primary prevention focuses on nutrition education, fostering habit formation, enhancing early

health literacy, and promoting healthy school environments. It is equally important to involve stakeholders at all levels. Teachers, parents, school staff, nutritionists, food vendors, and community-based organizations may all play a role in shaping and supporting school nutrition efforts. Their collective involvement strengthens accountability and cultural relevance. To oversee and guide these efforts, national and state-level advisory committees are encouraged to incorporate lifestyle medicine principles, track the adoption of habits, and offer guidance on behaviorally-informed interventions. These bodies may support that policies remain grounded in evidence and respond to emerging public health needs.

9.10. INVEST IN CAPACITY BUILDING AND RESOURCES

Teachers and other school staff require continuous training in nutrition literacy and behavior change communication (BCC) strategies to be effective facilitators. Capacity building efforts may go beyond a one-time orientation and provide ongoing support and updated content. Training can support teachers in serving as Food and Lifestyle Coaches who exemplify healthy behaviours, integrate nudges into daily routines, and involve parents and communities in supporting healthy habits.

Funding may support the development of educational materials, where appropriate and consistent with programme objectives, alongside improvements in school infrastructure. Schools may benefit from facilities such as clean kitchens, designated dining areas, and spaces for growing vegetables, which can provide opportunities for practical and experiential engagement with food.

In addition, digital platforms present an opportunity to expand the reach of nutrition education. E-learning modules, educational games, and interactive apps can support classroom lessons and encourage self-learning at home.

9.11. EMBED MONITORING, EVALUATION, AND ADAPTIVE LEARNING

To measure impact and improve outcomes, every nutrition program may have a robust monitoring and evaluation (M&E) framework. This framework can include indicators such as changes in students' knowledge, attitudes, behaviour, and health outcomes including diet quality, physical activity, hydration, rest, and adherence to healthy routines. Real-time data systems can help schools and administrators identify gaps and adjust strategies quickly. It can also facilitate adaptive learning and accountability in schools and districts.

Feedback loops supported by timely data enable more responsive and accountable implementation. Further, investing in implementation research will help uncover what works best in different cultural and regional contexts. These insights are invaluable for refining approaches and expanding successful models.

9.12. ADOPT A LIFE COURSE PERSPECTIVE

Nutrition education can be viewed as a sustained effort across a child's life rather than a one-time intervention. From preschool through adolescence, children can receive consistent messages about food, health, and well-being.

Integration of family and community engagement reinforces healthy habits outside the classroom, promoting holistic lifestyle literacy across generations. Outreach activities, parent engagement sessions, and community campaigns can make nutrition a shared responsibility.

The escalating prevalence of childhood obesity and malnutrition in India highlights an importance to integrate comprehensive food and nutrition education into the country's public health and education systems. To tackle the triple burden of malnutrition, obesity, and micronutrient deficiencies, it is important to enhance holistic lifestyle literacy. This approach can encompass education on physical activity, adequate sleep, emotional well-being, digital hygiene, and stress management within everyday learning. Embedding such education within national policy frameworks and reinforcing it through clear regulations, inclusive strategies, and coordinated multi-sectoral efforts is important. Embedding food literacy education within national policy frameworks is important. A dedicated "Food Literacy and Healthy Lifestyle Mission," aligned with NEP 2020 and Ayushman Bharat School Health program, and several other existing national programs can operationalize this vision. The mission can integrate school meals, classroom learning, and behavioral design tools to transform schools into environments that nurture lifelong health behaviors.

Delaying action risks further compromising the health and well-being of future generations. By prioritizing food literacy, creating enabling school environments, and addressing nutritional inequities, India has the opportunity to build a foundation for long-term health. A sustained, evidence-informed, and collaborative approach will be key to ensuring that every child can grow up healthy, informed, and empowered. The time to act is now.

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11
ANNEXURES

ANNEXURE A: SUGGESTED CONTENT OF SCHOOL-BASED FOOD AND NUTRITION EDUCATION

A1: Basic Nutrition Concepts

Topic	Key Elements	Age Group	Suggested Activity / Material
Food Groups	Carbohydrates, Proteins, Fats, Vitamins, Minerals, Water	Primary to Secondary	Food classification chart; group sorting activity using local foods
Balanced Diet	PROPORTION OF FOOD GROUPS, INDIAN DIETARY GUIDELINES (THALI MODEL)	Upper Primary to Secondary	Interactive "Build Your Plate" activity using Indian Thali visuals
Portion Control	Recommended serving sizes for children and adolescents	Middle to Higher Secondary	Use of visual plates or hand-based portion estimation techniques
Functions of Nutrients	Growth, energy, immunity, brain development, tissue repair	Upper Primary	Story-based role play or poster-making on "food as fuel"
Nutritional Needs by Age	Changing dietary requirements from childhood to adolescence	Upper Primary to Secondary	Comparative food charts by age; timeline-based growth and nutrition flipbook

A2: Food Safety and Hygiene

Topic	Key Elements	Age Group	Suggested Activity / Material
Personal Hygiene	Handwashing, nail cleanliness, use of gloves	Primary	Steps of handwashing, when to wash hands, personal grooming habits
Food Handling	Clean utensils, clean surfaces, sanitary cooking	Middle	Washing vegetables, using clean chopping boards, safe handling of raw foods
Cooking Practices	Proper temperature, thorough cooking	Secondary	Internal cooking temperatures, risks of undercooked food
Safe Water	Use of boiled/filtered water in food prep	Primary & Middle	Boiling, filtering, water source awareness
Storage & Expiry	Storage conditions, expiry dates, spoilage signs	Middle & Secondary	Identifying expiry vs. manufacturing dates, proper refrigeration, dry storage
Cross-Contamination	Separating raw/cooked foods, utensil hygiene	Middle & Secondary	Color-coded chopping boards, washing hands between tasks
Street Food Hygiene	Vendor cleanliness, open-air exposure risks	Secondary	Observing food covers, vendor personal hygiene, cleanliness of surroundings
Foodborne Illness	Common illnesses, symptoms, prevention	All age groups	Types of illnesses (e.g., typhoid), food sources, basic prevention practices

A3: Sustainable Food Choices

Component	Description	Examples (India-specific)	Relevance
Local Food Consumption	Encouraging consumption of food grown within regional proximity to reduce transport and support economy	Locally grown bananas in Tamil Nadu, millets in Karnataka, mustard greens in Punjab	Reduces food miles, supports local farmers, retains freshness
Seasonal Food Choices	Eating fruits and vegetables that are naturally available during specific seasons	Mangoes in summer, amla and carrots in winter, jackfruit in pre-monsoon	Enhances nutrition, lowers cost, aligns with body's seasonal needs
Dietary Diversity	Promoting inclusion of various food groups across meals	Inclusion of cereals (rice, wheat, millets), pulses, vegetables, fruits, dairy, nuts	Prevents micronutrient deficiencies, supports balanced diet
Traditional Grains	Reviving underutilized, native grains with high nutritional value	Millets (ragi, bajra, jowar), red rice, amaranth	Drought-resilient, nutrient-dense, culturally sustainable
Plant-Based Foods	Emphasizing plant-derived proteins and nutrients over animal-based foods where feasible	Lentils, chickpeas, leafy greens, groundnuts, soy	Lowers environmental footprint, supports sustainable agriculture
Minimizing Ultra-Processed Foods	Avoiding packaged snacks, sugary beverages, and processed meats	Reducing consumption of chips, instant noodles, soft drinks	Prevents obesity and diet-related NCDs, reduces packaging waste
Home/School Gardens	Encouraging cultivation of edible plants in home or school settings	Growing spinach, tomatoes, curry leaves, coriander in small plots or pots	Builds awareness, improves access to fresh produce, involves experiential learning
Environmentally Conscious Choices	Opting for foods that require less water, land, and energy	Choosing pulses over red meat, supporting organic/local markets	Reduces greenhouse gas emissions, conserves natural resources

A4: Critical Thinking on Food Marketing

Category	Key Aspects	Examples	Critical Thinking Tips
Advertisements	Persuasive messages designed to influence consumer behavior.	TV ads, online banners, celebrity endorsements, jingles.	Question motives, check for exaggeration, research health claims.
Food Labels	Information on packaging about ingredients, nutrition, and health claims.	"Low fat", "sugar-free", "organic", nutrition facts panel.	Read full ingredient lists, understand serving sizes, recognize misleading terms.
Food Myths	Widely believed but false or misleading ideas about food and nutrition.	"Carbs make you fat", "Detox diets cleanse your body", "Natural means healthy".	Cross-check with scientific sources, ask for evidence, don't rely on popular opinions.
Marketing Tactics	Psychological and visual strategies to influence decisions.	Bright packaging, buzzwords like "superfood", limited-time offers.	Recognize emotional appeals, avoid impulse buys, compare with alternatives.
Health Claims	Statements suggesting a relationship between a food product and health.	"Boosts immunity", "Heart healthy", "Supports weight loss".	Look for scientific backing, check for official certifications, avoid vague claims.

ANNEXURE B: TEACHING METHODS FOR MAXIMUM IMPACT

B1: Experiential Learning Activities

Method	Sample Activities	Learning Environment	Facilitator Involvement
Cooking-based Learning	Preparing sprout salads, assembling tiffins	School kitchen/classroom	Home science teachers, chefs
Gardening Projects	Creating a vegetable patch, composting demos	Outdoor/garden space	Science or biology teachers
Tasting Sessions	Local millet tasting, fruit/vegetable sampling	Classroom or school events	Nutrition experts or school staff

B2: Story-Based and Interactive Teaching Approaches

Format	Characters/Tools Used		Engagement Strategy	Delivery Method
Story Narratives	Aaru, Ami, Rinky		s	Read-alouds, printed books
Puppet Skits	Vegetable and fruit puppets		Visual and participative	Live performance or recorded video
Comics and Illustrations	Nutrition-themed comic panels		Humor, color, and simplicity	Distributed in print or displays

B3: School-Wide Campaigns and Activities

Activity Type	Target Audience	Timing	Execution Partners
Healthy Food Competitions	Students and teachers	Quarterly	School staff, parent volunteers
Thematic Awareness Days	Whole school	National Nutrition Week	Health department/local NGOs
Zero-Waste Lunch Challenges	Students and parents	Monthly or bi-monthly	Eco clubs, community leaders

B4: Parent and Community Involvement Strategies

Engagement Mode	Activity Example	Level of Participation	Follow-up Mechanism
Informational Sessions	Nutrition talks during PTMs	High (group-based)	Feedback forms, Q&A sessions
Collaborative Events	Cook-alongs, healthy potluck lunches	Medium to high	Photos/newsletter coverage
Take-home Activities	Weekly family food diaries	Low to medium	Review during class or assembly

B5: Integration of Technology and Digital Tools

Technology Used	Purpose	Integration Mode	Age Appropriateness
Mobile Applications	Food quizzes, balanced meal games	During free periods or ICT	10–14 years
Educational Videos	Explain food digestion or local crops	Science or health periods	6–14 years
Interactive Worksheets	Track daily meals, food pyramid puzzles	Homework or computer lab time	8–12 years

FOOD AND NUTRITION EDUCATION IN SCHOOLS IN INDIA:
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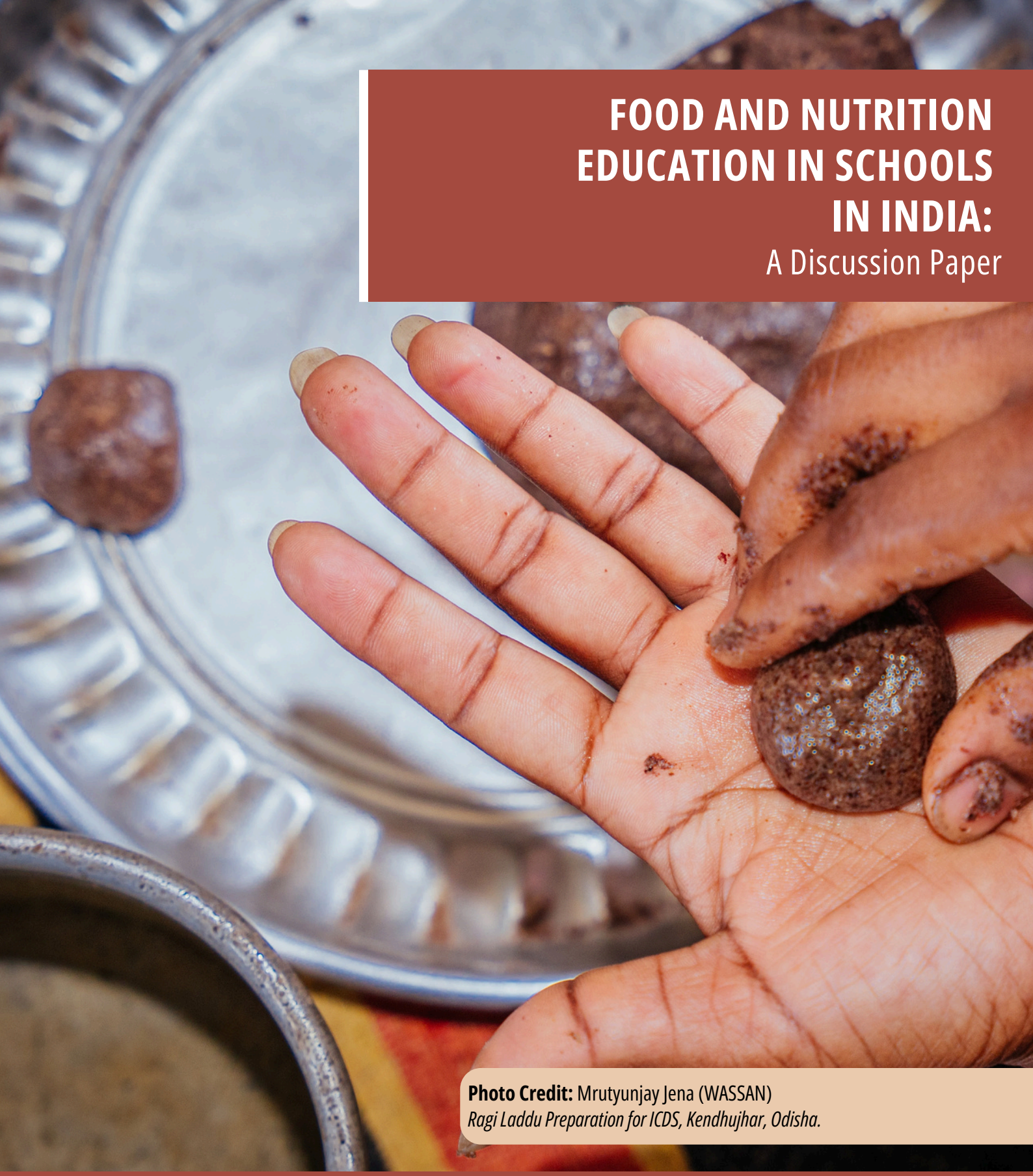

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COALITION FOR FOOD SYSTEMS TRANSFORMA(C)TION IN INDIA
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