

Effectiveness of a nurse-led nutritional education programme on the prevention of childhood malnutrition among school-age children

Navdeep Singh^{*1}, Rimpi Devi², Shiwani Kumari³

^{*1}*Principal, Indus College Of Nursing, Khanda Kheri, Hansi, Haryana-125038*

²*Professor Cum Vice Principal, Indus College Of Nursing, Khanda Kheri, Hansi, Haryana -125038*

³*Tutor, Indus College Of Nursing, Khanda Kheri, Hansi, Haryana-125038*

DOI: 10.5281/zenodo.21990064

Abstract:

Childhood malnutrition remains an important public health concern and includes undernutrition, micronutrient deficiencies, overweight and obesity. Although considerable attention has traditionally been directed towards malnutrition during the first five years of life, the school-age period represents a critical developmental stage during which dietary behaviours, food preferences, nutritional knowledge and lifestyle patterns become increasingly established. Schools provide a structured and accessible platform for delivering nutrition education because children spend a substantial proportion of their waking hours in educational settings and can be reached simultaneously with teachers, parents, peers and other members of the school community. Nurses are particularly well positioned to lead nutritional education because of their competencies in health assessment, counselling, health promotion, behaviour change, family education, growth monitoring and coordination of community resources. This review examines the effectiveness and potential mechanisms of nurse-led nutritional education programmes in preventing childhood malnutrition among school-age children.

Evidence from school-based nutrition interventions indicates that education can improve nutritional knowledge, attitudes, dietary practices, fruit and vegetable intake and selected anthropometric outcomes, although effects on body mass index and broader nutritional status are less consistent when education is delivered as an isolated intervention. Murimi et al. identified several characteristics associated with successful child nutrition education programmes, including repeated exposure, experiential learning, parental participation, appropriate theoretical frameworks and integration into the school environment. More recent evidence similarly suggests that interventions combining education with supportive school food environments, family engagement and opportunities for practical skill development are more likely to produce meaningful behavioural changes. Nurse-led interventions provide an additional advantage because nurses can individualise counselling, identify children at nutritional risk, communicate with families, monitor growth and facilitate referral when nutritional problems require clinical management. Francis et al. reported that nurse-involved school interventions were associated with improvements in anthropometric, nutritional knowledge, attitude and behavioural outcomes, while Whitehead et al. found that nurse-led interventions commonly incorporated education, counselling and motivational interviewing.

The effectiveness of a nurse-led nutritional education programme is therefore likely to depend not simply on the delivery of nutrition information but on the extent to which education is transformed into sustained dietary behaviour and supported by the child's family and school environment. Programmes should be developmentally appropriate, culturally relevant, participatory and sufficiently long to allow behaviour change. They should address both forms of malnutrition—undernutrition and excess weight—while incorporating food diversity, micronutrient adequacy, healthy meal patterns, food hygiene, hydration, physical activity and responsible consumption of energy-dense foods. Regular assessment using age-appropriate anthropometric indicators and dietary measures is also necessary. Overall, the available evidence supports nurse-led nutritional education as a valuable component of school-based malnutrition prevention, particularly when embedded within a broader whole-school and family-centred approach.

Keywords:

childhood malnutrition; school-age children; nurse-led intervention; nutritional education; school health nursing; undernutrition; obesity prevention; dietary behaviour; health promotion; nutrition education.

1. Introduction:

Malnutrition in childhood is a multidimensional public health problem encompassing inadequate energy and nutrient intake, micronutrient deficiencies, underweight, wasting, stunting and, increasingly, overweight and obesity. The traditional understanding of childhood malnutrition has focused predominantly on insufficient food intake and infectious disease; however, the contemporary nutrition landscape is characterised by a double or triple burden in which undernutrition, micronutrient deficiencies and excessive weight may coexist within the same population, household or community. The school-age period is particularly important because children between approximately 5 and 19 years' experience substantial physical, cognitive and social development while increasingly making independent decisions about food selection and consumption. WHO recognises that dietary behaviours and preferences established during childhood and adolescence may persist into adulthood, making early nutrition promotion an important component of long-term disease prevention (WHO, 2026).

The school environment offers an exceptionally important setting for addressing malnutrition. Children attend school regularly, interact with peers, receive meals or snacks in many educational settings and are exposed to food marketing and availability around school premises. Consequently, the school can influence both what children know about nutrition and the environments in which dietary choices are made. WHO's Nutrition-Friendly Schools Initiative emphasises that effective school nutrition programmes should extend beyond classroom education and include nutrition policies, capacity building, health-promoting curricula, supportive food environments and school nutrition and health services (WHO, 2021).

Nutrition education is an important mechanism through which children can acquire the knowledge, attitudes and practical skills necessary to make healthier food choices. However, knowledge alone does not necessarily result in behavioural change. A child may understand that fruits and vegetables are healthy but still consume highly processed snacks because they are inexpensive, easily available, socially desirable or preferred by peers. Similarly, an undernourished child may know the importance of eating a balanced diet but remain unable to obtain sufficient nutritious food because of household food insecurity. Therefore, contemporary nutrition programmes increasingly recognise that education must be combined with environmental, behavioural and family-level strategies.

Nurses have an important role in this context. School and community nurses routinely engage in health education, screening, counselling, disease prevention, family communication and referral. They can identify children whose growth patterns suggest nutritional risk, provide tailored counselling, involve parents, coordinate with teachers and link families to community resources. School nurses can also reinforce nutrition messages repeatedly rather than delivering a single educational session. Their clinical background allows them to connect nutritional behaviours with growth, immunity, concentration, physical activity and disease prevention.

Evidence concerning school-based nutrition interventions has generally demonstrated positive effects on selected dietary outcomes, although effects on anthropometric measures are heterogeneous. An umbrella review of school-based nutrition interventions among children aged 6–18 years reported evidence of beneficial effects on some dietary outcomes, including fruit and fruit-and-vegetable intake, while also emphasising methodological limitations in the existing review literature (O'Reilly et al., 2021). Similarly, Murimi et al. found that effective nutrition education interventions frequently involved multiple sessions, parental engagement, practical activities, behavioural strategies and integration into the school curriculum.

The role of nurses is especially relevant because school nursing interventions can bridge education and health services. Whitehead et al. reviewed randomised trials of nurse-led childhood obesity prevention and reported that nurse-led programmes commonly used education, counselling and motivational interviewing, often involving parents and targeting diet and physical activity (Whitehead et al., 2021). More recent evidence has also highlighted the contribution of nurses to school-level policy, systems and environmental interventions aimed at improving healthy nutrition and preventing obesity (Francis et al., 2025).

Although many studies focus on obesity prevention, the same school nursing platform can be adapted to prevent undernutrition and micronutrient deficiencies. The objective should not be simply to reduce body weight or increase food intake, but to achieve healthy growth and nutritional adequacy. A comprehensive

nurse-led programme should therefore address the full spectrum of malnutrition.

This review discusses the rationale, components, mechanisms, evidence, implementation strategies, outcome measures, barriers and future directions associated with nurse-led nutritional education programmes for school-age children.

2. Concept of childhood malnutrition:

Childhood malnutrition refers to deficiencies, excesses or imbalances in energy and nutrient intake relative to the physiological requirements of the child. It includes undernutrition, micronutrient deficiencies and overweight/obesity. These conditions are not mutually exclusive and may occur simultaneously at population or household level.

2.1. Undernutrition:

Undernutrition includes wasting, stunting and underweight. Although stunting and wasting are more commonly measured in children under five years, nutritional deficits can continue throughout the school-age period and can influence physical growth, school performance and future health.

School-age children may experience inadequate dietary intake because of household food insecurity, poverty, recurrent infection, intestinal parasitic disease, poor dietary diversity, inadequate school meals, restrictive food practices or limited nutritional knowledge. In low-resource settings, these factors frequently interact. Akombi et al. identified socioeconomic, environmental, maternal and household factors associated with childhood stunting, wasting and underweight in sub-Saharan Africa (Akombi et al., 2017).

2.2. Micronutrient deficiencies:

Micronutrient deficiencies include inadequate intake or absorption of iron, folate, vitamin A, iodine, zinc and other essential micronutrients. Iron deficiency and iron-deficiency anaemia are particularly important during childhood because iron is required for haemoglobin synthesis, neurological development and cognitive function.

Educational interventions can improve knowledge and dietary behaviour, but children with established micronutrient deficiencies may require supplementation, treatment or referral. A recent systematic review and network meta-analysis reported that iron and micronutrient interventions improve haemoglobin and reduce anaemia risk in school-age children, demonstrating that education should complement—not replace—appropriate clinical and public health interventions (2025 review).

2.3. Overweight and obesity:

The nutritional transition has resulted in increasing childhood overweight and obesity in many countries. Children may consume diets rich in sugar, saturated fat and highly processed foods while having insufficient physical activity. The problem is particularly important because childhood obesity increases the risk of later cardiometabolic disease.

WHO's recent school-food guideline emphasises that schools can help prevent unhealthy dietary patterns by improving food availability, establishing nutrition standards and creating supportive food environments (WHO, 2026).

Thus, prevention programmes should avoid treating malnutrition exclusively as a problem of insufficient food. A healthy child requires adequate, balanced, diverse and safe food rather than simply more calories.

3. Why the school-age period is critical:

The school-age period is characterised by rapid changes in physical growth, cognitive development, independence and social interaction. Children progressively develop their own food preferences and become increasingly influenced by peers, advertising, school food environments and family practices.

Schools provide several advantages for nutrition interventions:

1. **Regular access to children**
2. **Structured learning opportunities**
3. **Potential access to parents and caregivers**
4. **Availability of teachers and school administrators**
5. **Opportunities for environmental modification**
6. **Possibility of repeated monitoring**
7. **Integration with school meal programmes**
8. **Peer influence and social learning**

9. Opportunities for practical food activities

10. Links with community health services

WHO's Nutrition-Friendly Schools Initiative identifies nutrition education as only one part of a broader framework that includes school policy, capacity building, supportive environments and health services (WHO, 2021).

This is particularly relevant to nurse-led programmes. A nurse can move between these components, providing education while also monitoring growth, counselling families and identifying environmental barriers.

4. Rationale for nurse-led nutritional education:

Nurses occupy a distinctive position between the healthcare system, school and family. Their role is not limited to the treatment of illness. Health promotion and prevention are central nursing functions.

A nurse-led nutrition programme can include:

- nutritional screening;
- growth monitoring;
- dietary assessment;
- individual counselling;
- group education;
- parent education;
- teacher training;
- motivational interviewing;
- behaviour-change strategies;
- practical demonstrations;
- food hygiene education;
- referral for nutritional disorders;
- follow-up and reinforcement.

School nurses also have opportunities to identify social determinants of nutritional health. For example, a child with recurrent underweight may require assessment of food insecurity rather than simply being told to "eat more". Similarly, a child with excess weight may require assessment of dietary patterns, sedentary behaviour, family practices and school food availability rather than receiving weight-focused counselling alone.

Francis et al. found that nurse-involved school-based policy, systems and environmental interventions produced improvements in anthropometric outcomes and nutrition-related knowledge, attitudes and beliefs in several studies, supporting the potential for nurses to operate beyond one-to-one counselling and participate in broader school health strategies.

5. Theoretical basis of nurse-led nutritional education:

Effective nutrition education should be theoretically informed rather than consisting exclusively of information transmission. Several behavioural theories can guide programme design.

5.1. Health belief model:

The Health Belief Model proposes that health behaviour is influenced by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy.

A nurse can apply this framework by helping children understand:

- why poor nutrition may affect growth;
- how unhealthy food patterns may influence future health;
- the benefits of nutritious foods;
- practical ways of overcoming barriers;
- achievable dietary goals.

Moitra et al. used a behaviourally focused nutrition education intervention based on the Health Belief Model among Indian adolescents and incorporated weekly nutrition education and parent sessions, demonstrating the feasibility of theoretically guided school nutrition interventions (Moitra et al., 2021).

5.2. Social cognitive theory:

Social Cognitive Theory emphasises observational learning, self-efficacy, environmental influences and reciprocal interactions between behaviour and surroundings.

For school nutrition, children can observe:

- teachers selecting healthy foods;
- peers consuming fruits;
- parents preparing nutritious meals;
- nurses demonstrating healthy snacks;
- school cafeterias offering healthier alternatives.

Practical demonstrations may therefore be more effective than lectures alone.

5.3. Transtheoretical model:

Children and families may differ in readiness to change. Some may be unaware of dietary problems, whereas others may already be attempting to change.

Nurses can adapt counselling to readiness:

Precontemplation → Contemplation → Preparation → Action → Maintenance

This prevents the programme from assuming that all children require the same intervention.

5.4. Behaviour change communication:

Behaviour change communication combines education with reinforcement, goal setting, feedback and social support. It is particularly useful where dietary behaviour is influenced by multiple determinants.

6. Components of a nurse-led nutritional education programme:

A comprehensive programme should contain multiple interacting components.

6.1. Initial nutritional assessment:

Before education begins, the nurse should assess:

- age;
- sex;
- height;
- weight;
- BMI-for-age;
- growth trajectory;
- dietary diversity;
- meal frequency;
- breakfast consumption;
- fruit and vegetable intake;
- intake of energy-dense foods;
- sugary beverage consumption;
- physical activity;
- sedentary behaviour;
- food hygiene;
- relevant medical history;
- socioeconomic and household factors.

For school-age children aged 5–19 years, WHO recommends the 2007 growth reference, and WHO AnthroPlus can be used for anthropometric assessment and nutritional surveys.

6.2. Nutrition knowledge education:

Educational content should be age appropriate.

Core topics may include:

- food groups;
- balanced diet;
- portion awareness;
- food diversity;
- breakfast;
- healthy snacks;
- fruits and vegetables;
- whole grains;
- pulses and legumes;
- milk and dairy or appropriate alternatives;
- protein sources;
- healthy fats;
- water consumption;
- limiting excess sugar, salt and unhealthy fats;
- food hygiene;
- reading food labels;
- physical activity.

6.3. Practical education:

Practical learning can include:

- preparing simple healthy snacks;
- identifying food groups;
- building a balanced plate;
- reading nutrition labels;
- comparing beverages;

- measuring sugar content;
- school garden activities;
- fruit and vegetable tasting;
- healthy lunch-box demonstrations.

Evidence suggests that experiential activities such as gardening, tasting and cooking may strengthen the effectiveness of school nutrition education (2025 systematic review).

6.4. Parent involvement:

Parents determine much of the home food environment. Therefore, parental engagement should be an essential component rather than an optional addition.

Parents can receive:

- short educational sessions;
- printed or digital materials;
- healthy meal plans;
- low-cost recipe ideas;
- guidance on lunch boxes;
- information about micronutrient-rich foods;
- advice on limiting sugary beverages;
- strategies for reducing excessive processed-food consumption.

Murimi et al. identified parental involvement as one factor associated with effective nutrition education interventions in children.

6.5. Teacher participation:

Teachers spend considerable time with children and can reinforce messages between nursing sessions. Nurse-led teacher orientation may cover:

- recognising nutritional risk;
- reinforcing healthy food messages;
- encouraging water intake;
- supporting healthy school events;
- identifying children requiring referral.

6.6. Individual counselling:

Children identified as nutritionally vulnerable should receive individual counselling. This may include children who are:

- underweight;
- overweight;
- rapidly gaining or losing weight;
- suspected of having micronutrient deficiency;
- frequently skipping meals;
- reporting food insecurity;
- consuming highly restricted diets.

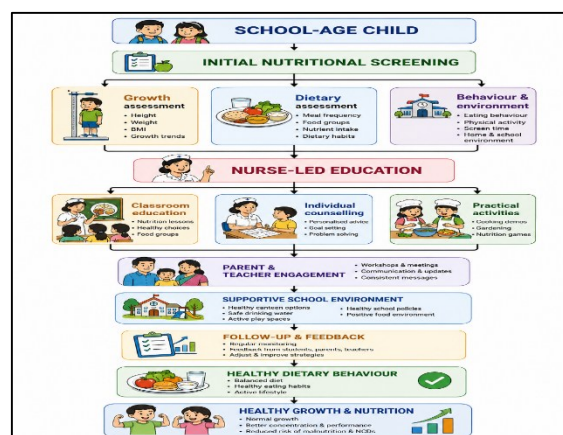


Figure.1: Proposed structure of a nurse-led nutritional education programme

7. Educational content for prevention of undernutrition:

A nurse-led programme should explicitly address undernutrition rather than focusing exclusively on obesity.

7.1. Dietary diversity:

Dietary diversity is an important marker of diet quality. Children should be encouraged to consume foods from multiple food groups rather than relying heavily on one staple food.

Education should emphasise locally available foods such as:

- cereals and millets;
- pulses;
- eggs;
- milk and dairy products;
- green leafy vegetables;
- seasonal fruits;
- nuts and seeds;
- fish or lean meat where culturally appropriate.

The objective is not to prescribe expensive foods but to teach families how to obtain nutritional diversity from affordable local options.

7.2. Breakfast:

Skipping breakfast may reduce dietary quality and contribute to hunger during school hours. Nurse-led education should explain the importance of regular meals and demonstrate inexpensive breakfast options.

7.3. Protein adequacy:

Protein is essential for growth and tissue development. Children should receive adequate protein through culturally appropriate sources.

7.4. Micronutrient-rich foods:

Education should promote iron-rich, vitamin-rich and mineral-rich foods. However, nurses should distinguish between dietary prevention and treatment. Established deficiencies may require medical evaluation and supplementation.

7.5. Food insecurity:

Nutrition education cannot eliminate poverty. Therefore, nurses should screen for food insecurity and link families with appropriate school feeding, community nutrition and social-support programmes.

School feeding programmes can provide an important nutritional safety net. In India, a systematic review of school mid-day meal programmes found evidence concerning nutritional and educational outcomes, although implementation and outcome effects varied between studies (Raveenthiranathan et al., 2024).

8. Prevention of overweight and obesity through nutrition education:

A complete malnutrition prevention strategy must also address excess weight.

Children should be taught to:

- reduce frequent consumption of sugar-sweetened beverages;
- limit highly processed snacks;
- increase fruits and vegetables;
- choose nutrient-dense foods;
- maintain regular meals;
- participate in physical activity;
- reduce prolonged sedentary time;
- develop appropriate sleep patterns.

WHO's current guidance highlights the importance of healthier school food environments because children are influenced not only by education but also by what foods are available and promoted around them.

Therefore, telling a child to "make healthy choices" while the school canteen primarily sells unhealthy foods represents an incomplete intervention.

9. Evidence for school-based nutrition education:

The literature suggests that school-based nutrition education can improve several intermediate outcomes.

A systematic review by Murimi et al. identified 41 child nutrition education studies and concluded that

successful programmes tended to share common characteristics including multiple exposures, parental involvement, experiential learning and appropriate intervention design.

An earlier systematic review by Silveira et al. found evidence that school nutrition education could improve anthropometric outcomes and increase fruit and vegetable consumption, particularly when programmes lasted longer than one year, were incorporated into regular school activities and involved parents and food services (Silveira et al., 2011).

However, school nutrition education should not be expected to produce large changes in BMI in every child. A systematic review of school nutrition interventions in Asia found that multi-component interventions produced reductions in BMI and BMI z-score, whereas nutrition education alone did not consistently change BMI or BMI z-score (2022 systematic review).

This finding is important because nutritional health is influenced by food availability, household income, physical activity, culture and genetics. Education is therefore best understood as one component of a broader intervention.

10. Evidence specifically supporting nurse involvement:

The nurse's contribution extends beyond conventional classroom education.

Whitehead et al. reviewed randomised trials of nurse-led interventions for preventing childhood and adolescent overweight and obesity. The interventions frequently involved education, counselling and motivational interviewing and often included parents. The review concluded that nurse-led interventions represented a promising strategy, although the quality and heterogeneity of evidence limited certainty regarding the magnitude of effect (Whitehead et al., 2021).

Kubik et al. evaluated a school nurse-delivered secondary obesity prevention programme among 8–12-year-old children. The intervention demonstrated the feasibility of using school nurses to provide structured health behaviour support within schools (Kubik et al., 2021).

Similarly, a school-based intervention involving nurse-delivered counselling and exercise programming among adolescents demonstrated the feasibility of using school nurses as part of obesity prevention and weight-management approaches (2016 randomised trial).

Francis et al. further expanded the evidence base by examining nurse-involved policy, systems and environmental interventions. Their review included 20 interventions and found improvements across anthropometric, knowledge, attitude and behavioural outcomes in several settings.

These findings suggest that the nurse's value may be greatest when nursing education is integrated with screening, counselling, environmental modification and family engagement.

11. Evidence from india and other low- and middle-income settings:

India provides an important context for nurse-led school nutrition education because the country experiences both persistent undernutrition and increasing overweight and obesity.

The Food and Agriculture Organization's "Feeding Minds, Fighting Hunger" programme was evaluated in schools in Hyderabad. Children receiving classroom-based nutrition education demonstrated significantly greater improvement in nutrition knowledge than controls, with a moderate effect size (Dixey et al., 2006).

The MARG intervention reached thousands of Indian children, parents and teachers and demonstrated improvements in nutrition-related knowledge and behaviour following a large-scale school-based educational programme (Sharma et al., 2010).

Singhal et al. demonstrated that a school-based multi-component nutrition and lifestyle programme among urban Asian Indian adolescents could influence health-related behaviours and anthropometric and metabolic risk factors (Singhal et al., 2010).

A subsequent controlled intervention among Asian Indian adolescents incorporated lectures, group discussions, quizzes, individual counselling, physical activity promotion, healthier school canteen choices, parent and teacher health camps and student volunteers (Misra et al., 2011).

Moitra et al. reported that a 12-week behaviourally focused nutrition education programme based on the Health Belief Model, including parent sessions, improved nutrition-related knowledge, attitudes and practices among Indian adolescents (Moitra et al., 2021).

A school-based intervention in Shimla also demonstrated the potential of multicomponent health-behaviour interventions to improve healthy lifestyle awareness and practices among schoolchildren (Mahajan et al., 2022).

These studies support the feasibility of structured nutrition education in Indian schools. Nevertheless, many interventions have focused on obesity prevention or adolescents rather than primary prevention of undernutrition among younger school-age children. This represents an important evidence gap.

12. Nutrition education and dietary behaviour:

The ultimate purpose of education is behavioural improvement.

Dietary behaviours that should be monitored include:

- frequency of fruit consumption;
- vegetable consumption;
- breakfast intake;
- sugary drink consumption;
- snack choices;
- fast-food intake;
- meal regularity;
- dietary diversity;
- water intake;
- food-label use;
- portion awareness.

A school nutrition education intervention in Dundee found an increase in fruit consumption among intervention children and improvements in nutrition knowledge and subjective norms (Gibson et al., 2005).

The evidence indicates that behaviour change is more likely when children are actively involved. Programmes should therefore use games, demonstrations, peer learning, food tasting, cooking, gardening, quizzes, storytelling and challenges rather than relying solely on lectures.

13. Family engagement as a core component:

Children's diets are strongly influenced by household food availability and parental practices. Consequently, nurse-led programmes that ignore parents may have limited long-term effectiveness.

Parent involvement can include:

13.1. Parent workshops:

Short workshops can address:

- balanced meals;
- low-cost nutritious foods;
- healthy lunch boxes;
- meal planning;
- reducing sugary beverages;
- prevention of nutritional anaemia;
- food hygiene.

13.2. Take-home assignments

Children can complete activities with parents, such as:

- recording one day's meals;
- identifying food groups;
- preparing a healthy snack;
- comparing food labels;
- planning a healthy lunch.

13.3. Family counselling:

Children identified with nutritional risk may require individual family counselling.

13.4. Community linkage:

Families with severe food insecurity or nutritional problems should be connected to appropriate welfare and health services.

14. School food environment:

Education alone cannot overcome an unhealthy school food environment.

WHO's current guideline recommends policies addressing foods provided, served, sold and promoted in school environments, including nutrition standards, direct food provision and measures that nudge children towards healthier choices (WHO, 2026).

A nurse can contribute by:

- participating in school health committees;

- advising on healthy school celebrations;
- supporting healthy canteen policies;
- encouraging safe drinking water;
- advocating for nutritious school meals;
- monitoring food hygiene;
- identifying unhealthy food marketing;
- supporting nutrition campaigns.

School-level environmental changes may reinforce educational messages and improve sustainability.

15. Practical teaching methods:

Interactive classroom sessions

Sessions should ideally be short and interactive.

Examples:

Session 1: Understanding food groups

Session 2: Building a balanced plate

Session 3: Why breakfast matters

Session 4: Fruits and vegetables

Session 5: Iron-rich foods

Session 6: Healthy snacks

Session 7: Sugary drinks and processed foods

Session 8: Food hygiene

Session 9: Reading food labels

Session 10: Physical activity and healthy growth

Demonstration

The nurse can demonstrate a healthy lunch box or balanced plate using locally available foods.

Games

Examples include:

- food-group matching;
- healthy/unhealthy food sorting;
- nutrition quizzes;
- label-reading competitions;
- "build your plate" activities.

Peer education

Older children can be trained as nutrition ambassadors. Peer education may increase social acceptance of healthy behaviours.

Digital education

Where resources permit, nurses can use:

- educational videos;
- mobile messaging;
- digital quizzes;
- electronic reminders;
- online parent education.

Digital interventions should complement rather than replace personal interaction, especially in populations with limited digital access.

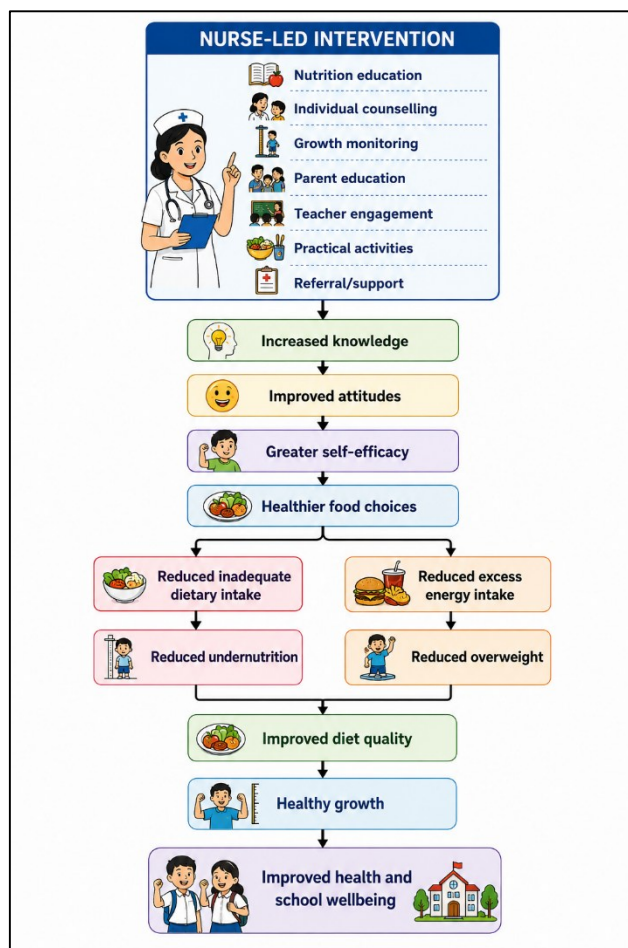


Figure. 2: Mechanism through which nurse-led nutritional education may prevent malnutrition

16. Prevention of nutritional anaemia:

Nutritional anaemia is an important concern in school-age children, especially where dietary iron intake is inadequate.

Nurse-led education can include:

- iron-rich food identification;
- vitamin C and iron absorption education;
- avoidance of inappropriate dietary practices;
- recognition of symptoms requiring assessment;
- adherence counselling where iron supplementation has been prescribed;
- deworming programme awareness;
- referral for suspected anaemia.

However, education should not be considered a substitute for diagnosis and treatment. A child with significant anaemia requires appropriate clinical evaluation.

Evidence from rural West Bengal demonstrated that combining health-nutrition education, parental involvement and medical interventions could reduce childhood anaemia prevalence more effectively than treatment without sustained behavioural support (Halder et al., 2012).

This illustrates an important principle: **education is most effective when it is integrated with appropriate health services.**

17. School feeding and nutrition education:

School feeding programmes can complement nutrition education.

A child may learn about a balanced diet but still lack access to nutritious food at home. School meals can provide an opportunity to convert educational messages into actual dietary exposure.

Evidence from Asia suggests that school nutrition interventions can influence nutritional status, although effects differ by intervention type and context. Multi-component approaches generally demonstrate greater potential than education alone (2022 systematic review).

In India, school meal programmes have been implemented partly to improve nutrition and educational

outcomes. A systematic review found evidence of benefits in selected nutritional and academic outcomes, although results varied across studies and settings (Raveenthiranathan et al., 2024).

Nurses can strengthen school feeding programmes by:

- educating children about meal choices;
- monitoring participation;
- supporting food hygiene;
- identifying children who do not consume meals;
- identifying nutritional concerns;
- communicating with parents and teachers.

18. Monitoring and evaluation:

Evaluation should include both process and outcome indicators.

Knowledge outcomes

Possible measures include:

- nutrition knowledge score;
- recognition of food groups;
- understanding of balanced meals;
- awareness of micronutrients;
- understanding of food hygiene.

Behavioural outcomes

Measures may include:

- fruit intake;
- vegetable intake;
- breakfast frequency;
- sugary beverage intake;
- snack patterns;
- dietary diversity;
- meal regularity.

Anthropometric outcomes

Potential indicators include:

- weight;
- height;
- BMI-for-age;
- height-for-age;
- weight-for-age where appropriate;
- growth trajectory.

WHO provides growth references for children aged 5–19 years that can support standardised nutritional assessment.

Clinical outcomes

Where feasible:

- haemoglobin;
- anaemia prevalence;
- micronutrient status;
- blood pressure;
- metabolic risk indicators.

Educational outcomes

Nutrition can affect school functioning. Therefore, evaluations may include:

- attendance;
- concentration;
- participation;
- school performance;
- fatigue-related complaints.

Recent evidence suggests that school nutrition programmes should consider educational outcomes alongside nutritional outcomes rather than treating nutrition as an isolated endpoint (Shinde et al., 2025).

19. Recommended evaluation framework:

A nurse-led programme should ideally measure outcomes at:

Baseline → Immediate post-intervention → 3 months → 6 months → 12 months

Short-term measurement can determine whether knowledge improves. Intermediate measurement can establish behavioural change. Longer follow-up is required to determine whether behaviour changes translate into healthy growth.

This is particularly important because BMI and growth patterns change naturally with age. A short-term educational intervention may improve knowledge without immediately changing anthropometric measures.

20. Dose and duration of intervention:

The intensity and duration of nutrition education are important.

Single-session interventions may increase awareness but are unlikely to produce sustained behaviour change. Repeated education provides opportunities for reinforcement.

The evidence reviewed by Murimi et al. indicates that successful nutrition education programmes often involve repeated contact and multiple educational components.

A practical nurse-led programme could involve:

- weekly sessions for 8–12 weeks;
- monthly reinforcement thereafter;
- quarterly nutritional screening;
- parent sessions every 2–3 months;
- continuous school environmental support.

Longer interventions may be more effective when they are integrated into routine school activities rather than functioning as temporary projects.

21. Importance of cultural adaptation:

Nutrition programmes should reflect local food habits, language, socioeconomic conditions and cultural practices.

A generic programme recommending expensive foods may be ineffective in low-income communities.

Instead, nurses should teach families how to improve nutritional quality using affordable local foods.

For example:

Instead of: "Eat expensive imported foods."

Teach: "Combine locally available cereals, pulses, vegetables, fruits, eggs or dairy products according to household availability."

Cultural adaptation also includes consideration of:

- religious food practices;
- traditional meals;
- seasonal foods;
- local cooking methods;
- family meal patterns;
- local school foods.

22. Addressing socioeconomic inequalities:

Nutrition education should be equity-oriented.

Children from disadvantaged households may have:

- lower dietary diversity;
- greater exposure to food insecurity;
- limited access to healthcare;
- higher risk of micronutrient deficiencies;
- increased exposure to inexpensive energy-dense foods.

A nurse-led programme should therefore distinguish between **knowledge deficits** and **resource deficits**.

If a family cannot afford nutritious food, repeating nutrition messages may not solve the problem. Nurses should work with schools and community services to identify appropriate resources.

Evidence from school nutrition interventions in low-resource settings indicates that environmental and food-based components may be particularly important when education alone cannot overcome structural barriers.

The systematic review of school nutrition interventions in sub-Saharan Africa found stronger evidence for supplementation and fortification interventions in improving micronutrient status than for education alone

(Muthuri et al., 2020).

22.1. nurse as educator:

The educational role of the nurse involves more than providing information.

The nurse should:

1. assess individual needs;
2. identify knowledge gaps;
3. establish realistic goals;
4. demonstrate practical behaviours;
5. reinforce positive behaviour;
6. address barriers;
7. involve parents;
8. coordinate teachers;
9. monitor progress;
10. refer when necessary.

The nurse can use motivational interviewing principles by asking open-ended questions and encouraging children to identify achievable changes.

For example:

Question: "Which healthy change do you think you could make this week?"

Rather than:

Instruction: "You must stop eating snacks."

The first approach promotes autonomy and self-efficacy.

22.2. Nurse as growth monitor:

Growth monitoring is an essential component of prevention.

A child who is progressively crossing downward growth trajectories may require early assessment before severe malnutrition develops. Similarly, rapid increases in BMI may indicate an emerging risk of overweight. WHO provides specific growth references for children aged 5–19 years, allowing standardised interpretation of growth and BMI-for-age.

Nurses can establish school health records containing:

- baseline anthropometry;
- follow-up measurements;
- dietary concerns;
- counselling provided;
- referrals;
- parental communication.

Confidentiality and child safeguarding principles must be maintained.

22.3. Nurse as care coordinator:

Some nutritional problems require multiple services.

For example:

Child with severe undernutrition

Nurse → school → parents → primary healthcare provider → nutrition service → follow-up

Child with suspected anaemia

Nurse → screening → clinical assessment → treatment → adherence counselling → reassessment

Child with obesity

Nurse → dietary assessment → family counselling → physical activity support → school environment → follow-up

This coordination role makes the nurse particularly valuable in school-based prevention.

23. Role of teachers:

Teachers should not replace nurses or nutrition professionals, but they can reinforce educational content.

Teacher training should focus on:

- healthy classroom practices;
- avoiding stigmatisation of children with obesity or undernutrition;
- encouraging healthy food choices;

- recognising signs of nutritional problems;
- supporting nutrition activities.

Nutrition education should avoid body shaming. Weight-focused language can contribute to stigma and unhealthy eating behaviours.

The objective should be **healthy growth and wellbeing**, not appearance.

24. Peer influence:

Children's food choices are strongly influenced by peers.

Peer-led activities can therefore reinforce healthy behaviours.

Examples include:

- nutrition clubs;
- healthy lunch competitions;
- fruit-and-vegetable challenges;
- school gardens;
- peer ambassadors;
- student health councils.

Peer involvement can make nutrition education more socially acceptable and enjoyable.

25. School gardens and experiential learning:

School gardens provide an opportunity to connect nutrition knowledge with food production.

Children can:

1. plant vegetables;
2. observe growth;
3. learn about food sources;
4. harvest produce;
5. participate in food preparation;
6. taste vegetables.

A recent systematic review of school nutrition programmes incorporating sustainability components found that experiential approaches such as gardening, tasting and cooking were more likely to demonstrate positive fruit-and-vegetable outcomes than programmes without these components (2025 systematic review).

26. Digital and technology-assisted nutrition education:

Digital technology can support nurse-led education through:

- short educational videos;
- WhatsApp or SMS reminders where appropriate;
- digital food diaries;
- online quizzes;
- parent messaging;
- growth-monitoring dashboards.

However, digital programmes should be designed with equity in mind because access to smartphones, internet connectivity and digital literacy varies.

Technology should supplement rather than replace the nurse-child relationship.

27. Strategies to overcome barriers:

Strengthening nurse training

Training should cover:

- child nutrition;
- growth assessment;
- dietary assessment;
- motivational interviewing;
- counselling;
- behaviour change;
- referral pathways.

Integrating nutrition into routine school health

Rather than creating a separate programme, nutrition education can be incorporated into routine school health activities.

Using low-cost resources

Local foods, pictures, games and demonstrations can reduce costs.

Engaging parents digitally

Short messages can reinforce educational content.

Establishing school nutrition committees

Nurses can collaborate with teachers, parents, administrators and food-service staff.

Developing referral pathways

Schools should have clearly defined pathways for children requiring clinical evaluation.

28. Ethical considerations:

Nutrition programmes involving children require careful attention to ethics.

Important principles include:

- informed parental consent where required;
- child assent where appropriate;
- confidentiality;
- non-stigmatising language;
- respectful communication;
- avoidance of weight-based discrimination;
- appropriate referral;
- secure health records.

Children should never be publicly labelled as "underweight" or "obese". Anthropometric findings should be communicated privately and sensitively.

29. Cost-effectiveness considerations:

Nurse-led education may be relatively inexpensive compared with intensive clinical interventions because it can be integrated into existing school health structures.

Cost-saving features may include:

- group education;
- peer education;
- teacher training;
- locally available foods;
- reusable educational materials;
- digital reinforcement;
- integration with existing school meals.

However, cost-effectiveness depends on programme intensity, staffing, training and local infrastructure.

School nutrition evidence supports this interpretation. In the Asian systematic review, multi-component interventions were associated with improvements in BMI and BMI z-score, whereas education alone did not consistently change anthropometric measures.

30. Proposed nurse-led programme model:

A practical programme can be organised into five phases.

Phase I: Preparation

- assess school needs;
- identify high-risk groups;
- train nurses;
- orient teachers;
- involve school administrators;
- develop culturally appropriate materials.

Phase II: Baseline Assessment

- height;
- weight;
- BMI-for-age;
- dietary questionnaire;
- nutrition knowledge;
- food environment;
- physical activity;
- socioeconomic concerns.

Phase III: Education

- weekly classroom sessions;
- practical demonstrations;
- individual counselling;
- parent education;
- teacher reinforcement.

Phase IV: Environmental Support

- healthy school food policy;
- safe drinking water;
- improved meal options;
- healthy school celebrations;
- school garden;
- physical activity opportunities.

Phase V: Follow-up

- repeat nutritional assessment;
- behaviour monitoring;
- parent feedback;
- referral;
- programme adaptation.

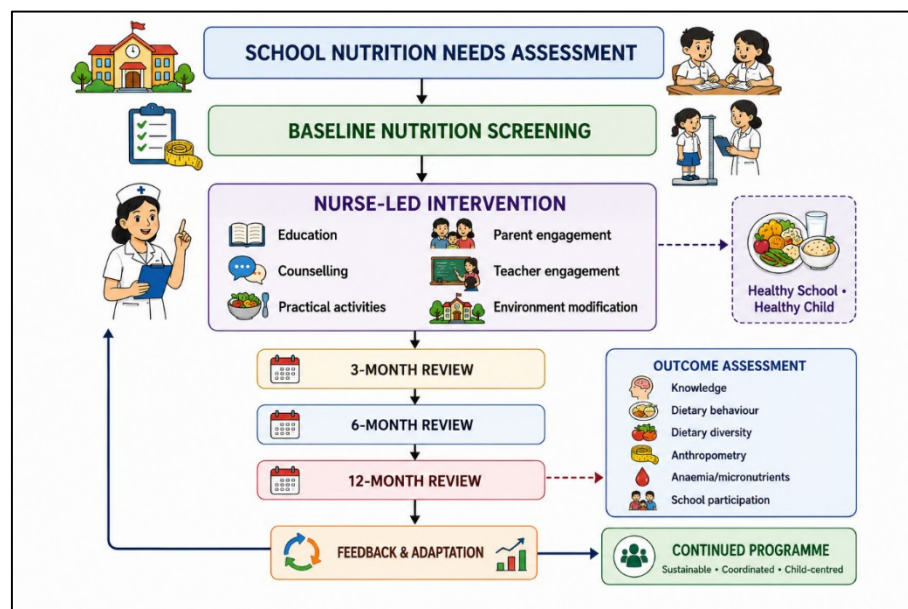


Figure. 3: Proposed implementation and evaluation cycle

31. Expected outcomes:

A successful nurse-led nutritional education programme may produce improvements at several levels.

Individual level

- improved nutrition knowledge;
- improved dietary diversity;
- healthier food choices;
- increased fruit and vegetable consumption;
- reduced consumption of unhealthy foods;
- improved meal regularity;
- improved self-efficacy.

Family level

- improved parental nutrition knowledge;
- healthier home food practices;
- better lunch-box preparation;
- improved recognition of nutritional risk.

School level

- healthier food environment;
- improved nutrition policies;
- increased health promotion activities;
- better identification of nutritionally vulnerable children.

Health level

- reduced risk of undernutrition;
- reduced micronutrient deficiency;
- reduced risk of overweight;
- healthier growth trajectories.

32. Limitations of current evidence:

Despite encouraging evidence, several limitations must be acknowledged.

First, many school nutrition studies focus on overweight and obesity rather than undernutrition. Therefore, evidence for prevention of underweight and micronutrient deficiencies through education alone remains less developed.

Second, intervention designs vary considerably in duration, intensity, educational content and outcome measurement. This heterogeneity makes direct comparison difficult.

Third, many studies rely on self-reported dietary intake, which may introduce recall and reporting bias.

Fourth, improvements in knowledge are easier to achieve than sustained behavioural change.

Fifth, anthropometric outcomes may require longer follow-up than many school studies provide.

Sixth, the specific independent contribution of nurses is often difficult to isolate because interventions are frequently multi-component and multidisciplinary.

The recent umbrella review literature also highlights substantial variation in outcomes and measurement tools used across school nutrition studies, supporting the need for standardised outcome frameworks (Olgacher et al., 2026).

32.1. Implications for nursing practice:

The evidence has several implications for nursing practice.

Nurses should regard nutrition promotion as an integral part of school health rather than an isolated educational activity.

Routine school health services can incorporate:

- growth assessment;
- dietary screening;
- nutrition education;
- family counselling;
- healthy lifestyle promotion;
- referral;
- follow-up.

Nurses should also participate in school policy development because the food environment can strongly influence children's behaviour.

The school nurse can act simultaneously as:

This multidimensional role distinguishes nurse-led nutrition programmes from conventional classroom nutrition education.

32.2. Implications for nursing education:

Nursing curricula should strengthen training in:

- paediatric nutrition;
- nutrition assessment;
- anthropometry;
- growth references;
- dietary counselling;
- motivational interviewing;
- food insecurity;
- school nutrition policy;
- health promotion;
- behavioural science.

Nursing students should also receive practical training in designing age-appropriate nutrition education materials.

32.3. Implications for school health policy:

School health policies should recognise nutrition as a core component of child wellbeing.

A comprehensive school nutrition policy should include:

1. healthy food standards;
2. safe drinking water;
3. nutrition education;
4. food hygiene;
5. school meal quality;
6. restriction of unhealthy food marketing;
7. growth monitoring;
8. referral systems;
9. parental engagement;
10. school health nursing.

WHO's 2026 guideline supports a whole-school approach to improving the food environment, recognising that children are influenced by foods provided, sold and promoted in school settings.

33. Discussion:

The evidence reviewed in this article indicates that nurse-led nutritional education has meaningful potential to contribute to childhood malnutrition prevention, but its effectiveness should not be interpreted as the consequence of information delivery alone. The central mechanism is behavioural and environmental transformation. Nutrition education can increase knowledge, but knowledge becomes clinically relevant only when it influences food selection, meal patterns, dietary diversity, physical activity and utilisation of available health resources.

School-based evidence provides a strong rationale for using educational settings as platforms for nutrition promotion. Schools have consistent contact with children and can integrate nutrition into curriculum, food provision, physical activity and health services. WHO's Nutrition-Friendly Schools Initiative explicitly conceptualises school nutrition through multiple interconnected components rather than classroom education alone (WHO, 2021).

The role of nurses is particularly valuable because nurses can combine education with assessment and follow-up. A teacher may effectively teach food groups, while a nurse can additionally identify whether a child is underweight, assess dietary patterns, counsel the family and refer the child for further evaluation. This creates a continuum between health education and health service delivery.

The literature also demonstrates that nutrition education can influence dietary behaviour. Studies from India, Europe, Africa and other settings have shown improvements in knowledge, attitudes and selected dietary practices following school-based programmes. The MARG programme demonstrated the scalability of nutrition education among Indian schoolchildren, while the Hyderabad Feeding Minds, Fighting Hunger intervention demonstrated measurable improvements in nutrition knowledge.

However, the evidence for anthropometric outcomes is less consistent. This is not necessarily evidence that nutrition education is ineffective. Rather, BMI and growth are distal outcomes influenced by many determinants. A short educational intervention may change a child's knowledge and dietary behaviour without producing an immediate measurable change in BMI. The Asian systematic review provides an important example: multi-component interventions were more likely to affect BMI and BMI z-score than education-only interventions.

This finding supports the proposed nurse-led model in which education is combined with parental involvement, school food environmental change, growth monitoring and referral.

34. Conclusion:

Childhood malnutrition remains a complex public health challenge that cannot be addressed through food provision or education alone. The school-age period offers a strategic opportunity for prevention because children are accessible through structured educational settings and are developing dietary behaviours that may persist into adulthood. Nutrition education can improve knowledge, attitudes and selected dietary behaviours, but its effect on nutritional status is more likely to be meaningful when education is combined with parental participation, supportive school environments, practical activities, growth monitoring and appropriate health

services.

Nurses are particularly well positioned to lead such interventions because they combine health education skills with clinical assessment, counselling, family engagement, growth monitoring and care coordination. Evidence from nurse-led interventions demonstrates potential improvements in nutrition-related knowledge, behaviour and selected anthropometric outcomes, while broader school nutrition evidence supports multi-component approaches over education alone.

A successful nurse-led nutritional education programme should therefore move beyond the traditional model of "teaching children what to eat". It should create a supportive system in which children understand healthy nutrition, families can implement practical dietary changes, schools provide healthier food environments and nurses identify and manage nutritional risk.

For undernutrition, the programme should emphasise dietary diversity, adequate energy and protein, micronutrient-rich foods, school feeding, food security and early identification of nutritional problems. For overweight and obesity, it should promote healthy dietary patterns, reduce excessive consumption of energy-dense and highly processed foods, and encourage physical activity without promoting weight stigma. This whole-spectrum approach is consistent with the contemporary understanding of malnutrition.

The available evidence supports nurse-led nutritional education as a feasible and potentially effective strategy for preventing childhood malnutrition, particularly when embedded within a whole-school, family-centred and community-linked framework. Future research should focus on younger school-age children, undernutrition and micronutrient deficiencies, long-term outcomes, cost-effectiveness and implementation in low-resource settings. Standardised outcome measures and rigorous randomised studies are also needed to clarify the independent contribution of nursing interventions.

35. References:

- (1) World Health Organization. Healthy diet. Geneva: World Health Organization; 2026.
- (2) World Health Organization. Nutrition action in schools: a review of evidence related to the Nutrition-Friendly Schools Initiative. Geneva: World Health Organization; 2021.
- (3) World Health Organization. Policies and interventions to create healthy school food environments: WHO guideline. Geneva: World Health Organization; 2026.
- (4) Murimi MW, Moyeda-Carabaza AF, Nguyen B, Saha S, Amin R, Njike V. Factors that contribute to effective nutrition education interventions in children: a systematic review. *Nutr Rev*. 2018;76(8):553-580. doi:10.1093/nutrit/nuy020.
- (5) Silveira JAC, Taddei JAAC, Guerra PH, Nobre MRC. Effectiveness of school-based nutrition education interventions to prevent and reduce excessive weight gain in children and adolescents: a systematic review. *J Pediatr (Rio J)*. 2011;87(5):382-392. doi:10.2223/JPED.2123.
- (6) O'Reilly GA, O'Connor L, McClure E, et al. School-based nutrition interventions for children and adolescents: an umbrella review of systematic reviews. *Nutrients*. 2021;13.
- (7) Muthuri SK, et al. Effectiveness of school-based nutrition interventions in sub-Saharan Africa: a systematic review. *Public Health Nutr*. 2020.
- (8) Akombi BJ, Agho KE, Hall JJ, Wali N, Renzaho AMN, Merom D. Stunting, wasting and underweight in Sub-Saharan Africa: a systematic review. *Int J Environ Res Public Health*. 2017;14(8):863. doi:10.3390/ijerph14080863.
- (9) Whitehead L, Kabdebo I, Dunham M, Quinn R, Hummelshoj J, George C, et al. The effectiveness of nurse-led interventions to prevent childhood and adolescent overweight and obesity: a systematic review of randomised trials. *J Adv Nurs*. 2021;77(12):4612-4631. doi:10.1111/jan.14928.
- (10) Francis L, Peterson JK, Peary A, Estrada-Ibarra E, Russell NG, Schroeder K. Nurse-involved policy, systems, and environmental school-based interventions for supporting healthy nutrition and obesity prevention among children and adolescents: a systematic review. *J Sch Nurs*. 2025;41(1):5-35. doi:10.1177/10598405241288538.
- (11) Kubik MY, Lee J, Fulkerson JA, Gurchich OV, Sirard JR. School-based secondary obesity prevention for eight- to twelve-year-olds: results from the Students, Nurses, and Parents Seeking Healthy Options Together randomized trial. *Child Obes*. 2021;17(3).
- (12) Moitra P, Madan J, Verma P. Impact of a behaviourally focused nutrition education intervention on attitudes and practices related to eating habits and activity levels in Indian adolescents. *Public Health Nutr*. 2021;24(8).
- (13) Singhal N, Misra A, Shah P, Gulati S. Effects of controlled school-based multi-component model of nutrition and lifestyle interventions on behavior modification, anthropometry and metabolic risk profile of urban Asian Indian adolescents in North India. *Eur J Clin Nutr*. 2010;64(4):364-373.

doi:10.1038/ejcn.2009.150.

- (14) Misra A, et al. Impact of intensive school-based nutrition education and lifestyle interventions on insulin resistance, β -cell function, disposition index, and subclinical inflammation among Asian Indian adolescents. *Metab Syndr Relat Disord*. 2011;9.
- (15) Sharma M, et al. Improvement in nutrition-related knowledge and behaviour of urban Asian Indian school children: findings from the MARG intervention study. *Br J Nutr*. 2010;104.
- (16) Dixey R, et al. Evaluation of the Food and Agriculture Organization's global school-based nutrition education initiative, Feeding Minds, Fighting Hunger, in schools of Hyderabad, India. *Public Health Nutr*. 2006.
- (17) Gibson EL, et al. The impact of a school-based nutrition education intervention on dietary intake and cognitive and attitudinal variables relating to fruits and vegetables. *Public Health Nutr*. 2005.
- (18) Haldar D, et al. A study on the role of parental involvement in control of nutritional anemia among children of free primary schools in a rural area of West Bengal. *Indian J Community Med*. 2012.
- (19) Raveenthiranathan L, et al. Impact of free school lunch program on nutritional status and academic outcomes among school children in India: a systematic review. *BMJ Open*. 2024.
- (20) Shinde S, Wang D, Moulton GE, Fawzi WW. School-based health and nutrition interventions addressing double burden of malnutrition and educational outcomes of adolescents in low- and middle-income countries: a systematic review. *Matern Child Nutr*. 2025;21(Suppl 1):e13437. doi:10.1111/mcn.13437.
- (21) Chatterjee P, Nirgude A. A systematic review of school-based nutrition interventions for promoting healthy dietary practices and lifestyle among school children and adolescents. *Cureus*. 2024;16(1):e53127. doi:10.7759/cureus.53127.
- (22) Mahajan A, Negi PC, Gandhi S, Sharma D, Grover N. Impact of school-based health behavioral intervention on awareness, practice pattern of healthy lifestyle, and cardiometabolic risk factors among school children of Shimla: a cluster-randomized intervention study. *Indian J Pediatr*. 2022;89(4):343-350. doi:10.1007/s12098-021-03786-6.
- (23) Olgacher D, Aldukair S, Clarke M, McCarthy D, Woodside JV. An umbrella review of systematic reviews of school-based nutrition interventions to determine outcomes used and their measurement tools. *Nutr Rev*. 2026;84(7):1401-1417. doi:10.1093/nutrit/nuaf144.
- (24) Greaves-Peters N, Koch PA, Wolf RL, Cadenhead JW. Educational and programmatic components of effective school-based food and nutrition education: an umbrella review. *Public Health Nutr*. 2026. doi:10.1017/S1368980026103024.
- (25) Lotito F, Maffeo M, Fiorini J. School nurse-led interventions for the prevention and management of childhood obesity: a scoping review. *J Pediatr Nurs*. 2026;88:177-187. doi:10.1016/j.pedn.2026.02.025.
- (26) Chawla, A., Chawla, P., Mangalesh, R. R., & Roy, R. (2011). *Asparagus racemosus* (Willd): biological activities & its active principles. *Indo-Global Journal of Pharmaceutical Sciences*, 2, 113–120.
- (27) Chawla, P., Chawla, A., Vasudeva, N., & Sharma, S. K. (2012). A review of chemistry and biological activities of the genus *Aerva*--a desert plant. *Acta Poloniae Pharmaceutica*, 69(2), 171–177.
- (28) Kumar, A., Chawla, A., Jain, S., Kumar, P., & Kumar, S. (2011). 3-Aryl-2-{4-[4-(2, 4-dioxothiazolidin-5-ylmethyl) phenoxy]-phenyl}-acrylic acid alkyl ester: Synthesis and antihyperglycemic evaluation. *Medicinal Chemistry Research*, 20(6), 678–686.
- (29) Shah, G., Chawla, A., Baghel, U. S., Rahar, S., Singh, P. S., & Dhawan, R. K. (2013). Pharmacognostic standardization of leaves of *Melaleuca leucadendron*. *Pharmacognosy Journal*, 5(4), 143–148.
- (30) Chawla, A., et al. (2012). Physical Properties and Dissolution Behaviour of Meloxicam/Poloxamer Solid Dispersions Prepared by Hot Melt Method and Microwave Assisted Method. *International Journal of Research in Pharmacy & Science*, 2(2), 64–74.
- (31) Kaur, H., Kaur, H., Chawla, A., Baghel, U. S., & Dhawan, R. K. (2014). A review: synthesis schemes of antimicrobial and anticancer thiazole derivatives. *Journal of Global Trends in Pharmaceutical Sciences*, 5(2), 1684–1691.
- (32) Varughese, J., & Jamuna, P. P. (2026). An Experimental Study To Assess The Effectiveness Of Lamaze Breathing Techniques On Reduction Of Labour Pain Perception And Duration Of Labour Among Primigravida Mothers. *International Journal of Drug Design and Discovery*, 16(31S), 464–474.
- (33) Seethi, J. P. P., & Suseela, S. (2025). Self-Efficacy: Believing in yourself matters. *International Journal*

of All Research Education and Scientific Methods (IJARESM).

- (34) Sohi, M. J. P. P. D. (2021). A STUDY TO EVALUATE THE EFFECTIVENESS OF PLANNED TEACHING PROGRAMME ON KNOWLEDGE REGARDING SELECTED ASPECTS OF REPRODUCTIVE HEALTH AMONG ADOLESCENT GIRLS IN A SELECTED PRE... *IDC International Journal*, 8(2), 9–12.
- (35) Jamuna, P. P., & Santham Sweet Rose, D. (2024). Stillbirth Prevention & Bereavement Care: A Comprehensive Review Article. *International Journal of Research and Analytical Reviews (IJRAR)*, 11(4), 740–744.