

Integrating Food and Nutrition Education into the School Curriculum: Challenges and Opportunities at the Elementary Level in Azad Jammu and Kashmir

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ABSTRACT

Food and nutrition education is increasingly recognized as an essential component of school health, learning, and lifelong well-being. Yet nutrition education is frequently treated as a peripheral topic within crowded elementary curricula, with limited attention to practical food skills, food environments, critical evaluation of food information, and culturally appropriate dietary practices. This paper examines the challenges and opportunities associated with integrating food and nutrition education into the elementary school curriculum in Azad Jammu and Kashmir (AJK). A qualitative curriculum policy analysis and integrative evidence synthesis were undertaken using recent peer-reviewed literature, international guidance, Pakistan-focused evidence, the National Curriculum of Pakistan, and publicly available AJK education-policy information. The synthesis indicates that elementary schools provide a strategic platform for developing functional, interactive, and critical food and nutrition literacy. Evidence from school-based interventions shows that teacher-facilitated lessons, food preparation, gardening, food tasting, label reading, experiential activities, and integration into existing subjects can improve nutrition knowledge and aspects of food literacy. However, implementation is constrained by curriculum overload, limited teacher preparation, insufficient teaching resources, weak school food policies, socioeconomic inequalities, rural-remote access challenges, and a persistent gap between nutrition knowledge and actual dietary behavior. Pakistan-specific evidence also points to a double burden of malnutrition and inadequate dietary patterns among school-aged children, while AJK evidence highlights significant childhood nutrition concerns. The paper proposes a context-sensitive AJK School Food and Nutrition Education Framework built around six domains: curriculum integration, teacher capacity, experiential pedagogy, healthy school food environments, family/community engagement, and monitoring and evaluation. The paper concludes that nutrition education should not be introduced as an additional, isolated subject; instead, it should be embedded across science, health, mathematics, language, social studies, physical education, and co-curricular activities, supported by teacher training and whole-school policies. Such an approach can strengthen nutrition literacy, support healthier choices, and contribute to the educational and health goals of AJK.

Keywords: Food and nutrition education; nutrition literacy; elementary education; curriculum integration; school health; Azad Jammu and Kashmir; Pakistan; experiential learning; healthy school food environment

INTRODUCTION

Childhood is a formative period in which dietary preferences, food-related knowledge, routines, and attitudes begin to develop and may influence health across the life course. Schools occupy a particularly important position because children spend a substantial proportion of their waking time in educational settings and because schools can reach children through formal curriculum, teachers, peer interaction, food environments,

and family engagement. The World Health Organization (WHO) has emphasized that schools are critical settings for shaping dietary habits and reducing nutrition-related inequalities. Its recent healthy school food guideline recommends a whole-school approach involving healthy food provision, standards for foods and beverages, and environmental strategies that make healthier choices easier (World Health Organization [WHO], 2025/2026).

Food and nutrition education is broader than teaching nutrient definitions. Contemporary food literacy approaches include the knowledge, skills, attitudes, and critical capacities required to select, prepare, evaluate, and consume food in ways that support health, culture, sustainability, and social well-being. A systematic scoping review of elementary-school food literacy interventions found substantial diversity in program design, but common approaches included classroom lessons, games, school gardens, food preparation, and cooking activities. The review also showed that most interventions addressed functional food literacy, while fewer addressed interactive and critical dimensions (Kelly et al., 2021). Similarly, a systematic review of primary-school interventions reported promising effects when programs were tailored to students' needs, incorporated into existing curricula, and delivered by teachers (Omidvar et al., 2023).

The issue is particularly relevant to Pakistan. A systematic review of school-aged children and early adolescents identified a double burden of malnutrition, including underweight, stunting, wasting, overweight, and obesity, alongside dietary patterns characterized by relatively high consumption of soft drinks and sweets and comparatively low consumption of protein-rich foods, fruits, and vegetables (Khan et al., 2022). More recent Pakistan-focused evidence indicates that school-based nutrition interventions can improve nutrition knowledge and literacy, although changes in dietary behavior are less consistent (Aboul-Enein et al., 2026). These findings suggest that knowledge is necessary but not sufficient; curriculum, family practices, affordability, availability, and school food environments must be addressed together.

AJK presents a distinctive educational and geographic context. The National Nutrition Survey 2018 reported nutrition concerns among children in AJK and described the region as containing urban and rural communities with diverse linguistic and cultural characteristics. The survey reported that available data indicated 32% stunting, 18% wasting, and approximately 26% underweight among children under five in AJK (Government of Pakistan, 2018). These figures concern younger children and should not be directly generalized to elementary-school populations; nevertheless, they demonstrate the importance of nutrition as a regional educational and public-health concern. AJK's proposed Education Policy 2023–2040 also emphasized curriculum improvement, teacher development, and modernization of teaching methods, creating a policy window for integrating practical health and nutrition competencies into school education (Government of Azad Jammu and Kashmir, 2023).

The present paper therefore addresses a gap at the intersection of education and nutrition: how food and nutrition education can be systematically integrated into elementary schooling in AJK, what barriers may hinder implementation, and what opportunities can be leveraged within existing educational structures. Rather than treating nutrition as an additional subject that competes for timetable space, the paper argues for curriculum integration and a whole-school model that connects classroom learning with children's real food environments.

Statement of the Problem

Despite the recognized importance of nutrition for child growth, learning, and long-term health, food and nutrition education is often fragmented across elementary curricula. Where nutrition concepts appear, they may emphasize factual knowledge such as food groups, balanced diet, hygiene, or nutrients without sufficient opportunities for students to apply knowledge through meal planning, food selection, label interpretation, gardening, preparation, budgeting, or critical evaluation of food marketing. This knowledge–practice gap is

especially important in settings where children experience unequal access to nutritious foods and where schools may simultaneously promote healthy eating through teaching while making less healthy foods readily available.

For AJK, the problem is compounded by geographical dispersion, differences in school resources, variation between urban and rural communities, limited specialist support, and the need to make curriculum content locally meaningful. The research problem is therefore not simply whether nutrition content exists in the curriculum, but whether it is sufficiently comprehensive, developmentally appropriate, practical, culturally responsive, teacher-supported, and connected to the school food environment.

Objectives of the Study

To examine the educational rationale and evidence base for integrating food and nutrition education at the elementary level.

To identify major curriculum, teacher, school-environment, family, socioeconomic, and implementation challenges relevant to AJK.

Research Questions

- What is the evidence supporting food and nutrition education in elementary schools?
- What major challenges may affect the integration and implementation of food and nutrition education in AJK elementary schools?
- What opportunities exist within the existing curriculum, teacher education, school environment, and community context?
- What curriculum and implementation framework could support effective food and nutrition education in AJK?

LITERATURE REVIEW

Food and Nutrition Literacy in Elementary Education

Food literacy can be understood as a multidimensional capacity that enables individuals to obtain, understand, evaluate, prepare, and use food in ways that support health and well-being. For elementary children, this means moving beyond memorizing food groups toward age-appropriate skills and decision-making. Functional competencies include identifying healthy foods, understanding basic nutrition concepts, recognizing food safety practices, and interpreting simple food information. Interactive competencies involve communicating about food, participating in food preparation, planning meals, and making choices with peers and family. Critical competencies include evaluating food marketing, recognizing misleading claims, considering affordability and culture, and understanding how food environments shape choices.

The distinction between functional, interactive, and critical literacy is useful for curriculum design because it prevents nutrition education from becoming a purely theoretical subject. Kelly et al. (2021) found that all 116 interventions in their elementary-school scoping review addressed functional food literacy, while 77% addressed interactive food literacy and only 28% addressed critical food literacy. This pattern suggests a common international challenge: schools may be relatively comfortable teaching basic nutrition facts but less prepared to teach children how to use knowledge in complex real-life contexts.

Evidence on School-Based Nutrition Education

Evidence generally supports school-based nutrition education, particularly for improving knowledge and selected food-literacy outcomes. Omidvar et al. (2023) reviewed 19 school-based interventions and found that promising programs were tailored to children's interests, incorporated into existing curricula, and facilitated by teachers. Common intervention components included recipe and food-preparation skills, food-label literacy, food tasting, gardening, and culturally relevant food practices. The authors concluded that future interventions should address all dimensions of food and nutrition literacy, particularly interactive and critical skills.

Teacher delivery is important because teachers provide continuity and can integrate nutrition concepts across subjects. A systematic review and meta-analysis of teacher-delivered nutrition education reported that schools can positively influence children's nutritional outcomes, while also identifying barriers faced by schools and teaching staff (Cotton et al., 2020). This finding has direct implications for AJK: curriculum reform without teacher preparation is unlikely to produce sustainable change.

Experiential and Whole-School Approaches

Food education becomes more meaningful when children can connect concepts to actual experiences. School gardens can provide opportunities to study plant growth, biodiversity, seasons, food production, and healthy eating. Food preparation can connect science, mathematics, language, hygiene, safety, and cultural knowledge. Food-label activities can develop mathematics and critical-thinking skills while helping children interpret serving sizes, ingredients, and nutrition claims. Such activities also make curriculum learning more authentic.

WHO's Nutrition-Friendly Schools Initiative identifies school nutrition policies, awareness and capacity building, nutrition and health-promoting curricula, supportive school environments, and nutrition and health services as interconnected components of school-based nutrition action (WHO, 2021). This whole-school orientation is important because classroom messages may be weakened when school food environments contradict them. WHO's more recent guidance similarly emphasizes food provision, standards or rules, and behavioral nudges within school environments (WHO, 2025/2026).

Nutrition and School-Age Children in Pakistan

Pakistan faces multiple forms of nutrition vulnerability. Khan et al. (2022), synthesizing 51 studies involving 62,148 children aged 5–15 years, reported pooled estimates of 25.1% underweight, 23% stunting, 24% wasting, 12.5% thinness, 11.4% overweight, and 6.9% obesity, while noting limitations in the available evidence. The same review identified dietary patterns involving high consumption of carbohydrates, soft drinks, and sweets/chocolates and lower consumption of protein-rich foods, fruits, and vegetables relative to recommended levels.

Pakistan-specific intervention evidence is encouraging. A 2026 scoping review identified 13 school-based nutrition intervention studies and concluded that nutrition education interventions consistently improved nutrition knowledge and literacy, although improvements in actual dietary behaviors were inconsistent (Aboul-Enein et al., 2026). A recent Pakistan study also developed an experiential food and nutrition curriculum for middle-school students after identifying limited practical competencies and strong student interest in participatory learning (Aamir et al., 2026). Although middle-school findings cannot be directly generalized to elementary pupils, they support the broader principle that nutrition education should be practical, contextualized, and integrated rather than purely theoretical.

Nutrition Education within Pakistan's Curriculum

The National Curriculum of Pakistan already provides entry points for health and nutrition concepts. For example, Grade 4–5 General Science learning outcomes include maintaining good health, recognizing behaviors that promote health, defining a balanced diet, identifying food sources in a balanced diet, and understanding the importance of clean drinking water (Ministry of Federal Education and Professional Training [MoFEPT], 2026). This is important because it indicates that integration does not necessarily require creating an entirely new subject. Instead, existing learning outcomes can be expanded from basic recognition toward application and critical thinking.

The National Curriculum Council was established to support minimum national standards and curriculum coherence, while recent curriculum reforms have emphasized standards, textbooks, teacher training, and examinations (MoFEPT, 2022/2026). AJK's education-policy direction has likewise emphasized curriculum improvement and teacher development (Government of Azad Jammu and Kashmir, 2023). These developments create an opportunity to embed a stronger food and nutrition literacy component into existing curriculum reforms.

Theoretical and Conceptual Framework

The proposed framework draws primarily on Social Cognitive Theory, experiential learning, and the whole-school health-promoting approach. Social Cognitive Theory emphasizes reciprocal relationships among personal factors, behavior, and environment. Applied to nutrition education, children need knowledge and skills, opportunities to practice those skills, supportive adults, positive peer norms, and environments in which healthy choices are feasible. Experiential learning complements this by emphasizing learning through concrete experience, reflection, conceptualization, and application. The framework also adopts a whole-school perspective. Nutrition education is most likely to become meaningful when curriculum, teachers, school food environments, family practices, and community resources reinforce one another. Therefore, the conceptual model is represented as follows

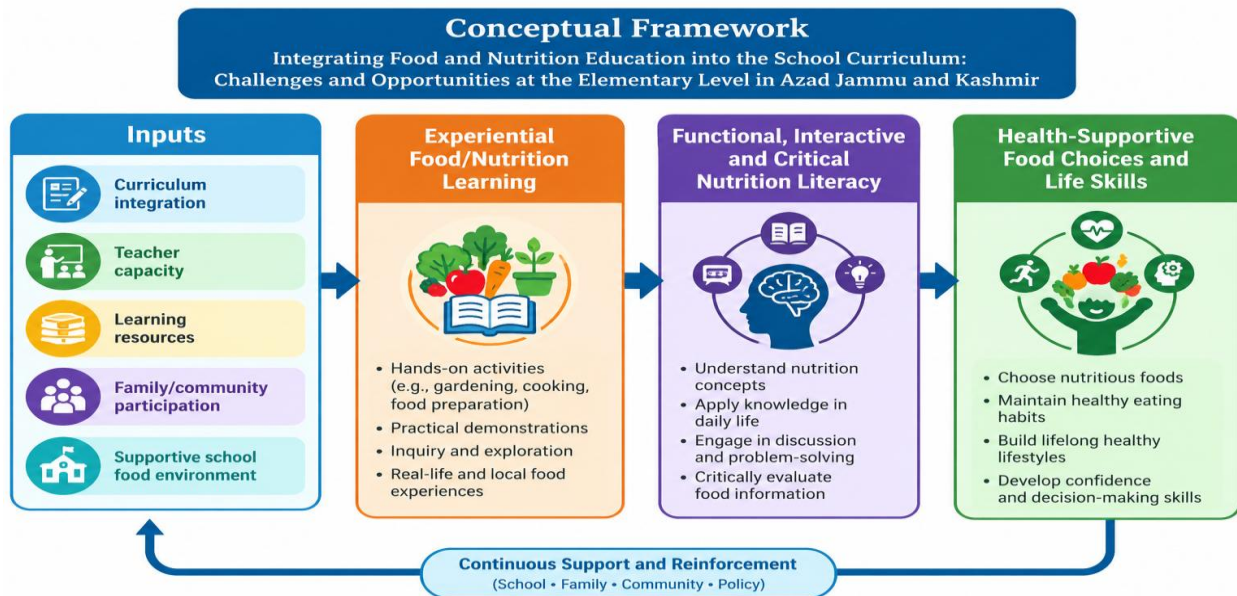


Table 1. Proposed Conceptual Domains for AJK Elementary Food and Nutrition Education

Domain	Core focus	Example elementary activities	Expected outcome
Functional literacy	Basic nutrition, hygiene, food groups, hydration, food safety	Food-group sorting; balanced plate; handwashing demonstration	Accurate basic nutrition knowledge
Interactive literacy	Planning, preparing, communicating and applying food knowledge	Simple recipes; meal planning; school garden; food diary	Practical food skills and confidence
Critical literacy	Food marketing, labels, affordability, culture and misinformation	Compare labels; analyze advertisements; discuss local foods	Critical decision-making
School environment	Availability and promotion of healthier foods	Healthy canteen guidance; water access; healthy snack messages	Consistency between teaching and environment
Family/community	Home practices and local food culture	Parent sessions; local food mapping; community garden	Home-school reinforcement
Monitoring	Learning and implementation quality	Knowledge/skill checks; observation; teacher reflection	Continuous improvement

METHODOLOGY

Research Design

The study used a qualitative curriculum–policy analysis combined with an integrative evidence synthesis. This design was selected because the research question concerns curriculum content, implementation conditions, educational opportunities, and policy alignment rather than estimating a population prevalence. The approach synthesizes evidence across international school-nutrition research, Pakistan-specific studies, national curriculum documents, WHO guidance, and publicly available AJK education-policy information.

Sources of Evidence

- Peer-reviewed systematic reviews, scoping reviews, intervention studies, and curriculum-development research concerning school nutrition and food literacy.
- WHO guidance and evidence on nutrition-friendly schools and healthy school food environments.
- Pakistan-focused studies concerning school-age nutrition and school-based nutrition interventions.
- National Curriculum of Pakistan documents relevant to health, balanced diet, hygiene, and related competencies.

- Publicly available AJK government information concerning education policy, curriculum improvement, teacher development, and modernization of schooling.

Search and Selection Strategy

Evidence was identified through targeted searches of scholarly and official sources using combinations of terms such as “food literacy,” “nutrition education,” “elementary school,” “primary school,” “school nutrition,” “Pakistan,” “Azad Jammu and Kashmir,” “curriculum,” and “teacher-delivered nutrition education.” Priority was given to systematic reviews, official guidance, recent Pakistan-focused evidence, and documents directly relevant to curriculum or education policy. Studies were retained when they addressed school-aged children, school-based nutrition education, food literacy, school food environments, curriculum development, or implementation factors relevant to elementary education.

Analytical Procedure

The analysis proceeded in four stages. First, evidence was organized according to the educational issue addressed. Second, findings were coded into thematic categories: curriculum, pedagogy, teacher capacity, resources, school food environment, family/community, equity, and monitoring. Third, international evidence was compared with the Pakistan and AJK context. Fourth, the themes were synthesized into an AJK-oriented implementation framework. Because this paper did not collect human participant data, no participant recruitment, consent procedure, or statistical analysis was undertaken.

Trustworthiness and Limitations of the Evidence Base

Trustworthiness was strengthened by prioritizing peer-reviewed systematic reviews and official sources and by distinguishing evidence directly observed in AJK from evidence that is relevant by contextual analogy. A key limitation is that published research specifically examining elementary food and nutrition education in AJK is limited. Therefore, the proposed challenges and opportunities should be treated as evidence-informed propositions requiring validation through field research in AJK schools. In addition, Pakistan's school nutrition literature is heterogeneous in age groups, interventions, settings, and outcomes, limiting direct comparison.

Findings and Thematic Analysis

Challenge 1: Curriculum Overload and Competing Priorities

Teachers operate within examination, timetable, and subject-completion pressures. Introducing nutrition as a separate subject could therefore face resistance and may be difficult to sustain. The evidence suggests that integration into existing curriculum is more feasible than adding a stand-alone subject. Science provides a natural home for nutrients, digestion, food safety, hydration, and human health; mathematics can address portions, measurement, budgeting, and food-label calculations; language can use food-related reading and writing tasks; social studies can explore agriculture, food culture, food security, and community resources; and physical education can connect diet, hydration, activity, and well-being.

Challenge 2: Limited Teacher Preparation

Teachers are central to school nutrition programs, but many elementary teachers are not nutrition specialists. The issue is not that teachers need clinical nutrition training; rather, they need practical pedagogical knowledge sufficient to teach age-appropriate concepts accurately and safely. Training should address basic nutrition, food safety, culturally appropriate dietary examples, misconceptions, participatory teaching methods, and use of low-cost resources. Teacher professional development is therefore a major implementation requirement.

Challenge 3: Knowledge–Behavior Gap

Nutrition education can improve knowledge without automatically changing dietary behavior. Children may know that fruits and vegetables are healthy but still select less nutritious foods because of taste, price, availability, peer influence, family practices, advertising, or school food environments. Pakistan-focused evidence similarly indicates that nutrition education produces stronger gains in knowledge and literacy than in behavior (Aboul-Enein et al., 2026). The implication is that AJK schools should combine education with opportunities to practice choices and with supportive environments.

Challenge 4: Resource and Infrastructure Differences

Schools differ in access to kitchens, gardens, safe water, digital resources, teaching aids, and trained personnel. A program that assumes sophisticated facilities may widen inequalities. The preferred model should therefore use low-cost, locally available resources. For example, teachers can use locally available foods, recycled containers for food-group activities, simple school gardens, paper-based food-label exercises, and household recipe demonstrations. Digital resources can supplement rather than replace low-tech learning.

Challenge 5: Socioeconomic and Geographic Inequalities

Healthy eating is partly constrained by household resources and local availability. Nutrition education should not stigmatize families or imply that all food choices are equally affordable. Instead, lessons should emphasize nutritious and affordable local options, seasonal foods, safe water, food waste reduction, and practical budgeting. Rural and remote schools require particular attention to transport, teacher availability, learning materials, and continuity of professional development.

Challenge 6: School Food Environment

If schools teach balanced diets while selling or promoting energy-dense foods and sugary drinks, children receive contradictory messages. WHO's whole-school approach highlights the importance of aligning the school food environment with curriculum messages (WHO, 2021; WHO, 2025/2026). AJK schools could gradually introduce healthy-school food standards, encourage safe drinking water, regulate the promotion of unhealthy foods, and establish simple healthy-snack guidance appropriate to local resources.

Opportunity 1: Existing Curriculum Entry Points

The strongest immediate opportunity is curriculum integration. Existing health and balanced-diet outcomes provide a foundation on which more practical competencies can be built. Rather than adding extensive new content, curriculum developers can map nutrition competencies across existing subjects and grade levels. This approach reduces timetable pressure and encourages interdisciplinary learning.

Opportunity 2: Teacher Training and Continuous Professional Development

AJK education reform discussions have emphasized teacher development and improved teaching quality. Nutrition education can be incorporated into pre-service teacher education and short continuing professional development modules. A five- to ten-hour introductory module could cover child nutrition basics, food literacy, lesson planning, experiential activities, food safety, and assessment. School-based professional learning communities could then share locally successful practices.

Opportunity 3: Local Food Culture and Indigenous Knowledge

AJK has rich agricultural and food traditions that can make nutrition education culturally relevant. Lessons can use familiar foods rather than relying exclusively on imported examples. Students can document seasonal fruits and vegetables, compare traditional and contemporary snacks, explore food preservation, discuss household food practices, and investigate how local agriculture contributes to food security. Cultural relevance can increase engagement while avoiding the assumption that healthy eating must imitate foreign dietary models.

Opportunity 4: Experiential Learning

The literature supports practical activities such as gardening, cooking, food tasting, recipe skills, and food-label interpretation. These can be adapted to elementary schools without expensive infrastructure. A school garden, for example, can support science, mathematics, environmental studies, and nutrition simultaneously. A simple “healthy lunchbox” activity can involve planning, measuring, drawing, writing, budgeting, and reflection.

Opportunity 5: Family and Community Partnerships

Parents and caregivers strongly influence children's food choices. Schools can provide brief parent information sessions, take-home activities, healthy lunchbox guidance, and community food projects. Local health workers, agricultural extension personnel, food specialists, and teacher educators could support schools where feasible. The goal should be partnership rather than blaming families for dietary practices.

Table 2. Major Challenges and Evidence-Informed Responses

Challenge	Likely effect	Recommended response
Curriculum overload	Low priority or superficial coverage	Integrate nutrition across existing subjects and outcomes
Teacher knowledge/confidence	Inaccurate or lecture-based teaching	Short CPD modules, teacher guides, peer learning
Knowledge–behavior gap	Limited dietary change	Experiential practice + supportive food environment
Resource disparities	Unequal implementation	Low-cost, locally available materials
Socioeconomic constraints	Healthy choices perceived as unaffordable	Teach affordable local foods and budgeting
Remote/rural access	Uneven training and monitoring	Cluster-based CPD, mobile/print resources, district support
Unhealthy school food availability	Contradictory messages	Healthy school food standards and water access
Weak assessment	Poor accountability	Simple knowledge, skill and implementation indicators

PROPOSED AJK SCHOOL FOOD AND NUTRITION EDUCATION FRAMEWORK

Based on the synthesis, an AJK School Food and Nutrition Education Framework is proposed. The framework is designed to be scalable, interdisciplinary, culturally responsive, and feasible in schools with different resource levels.

Pillar 1: Curriculum Integration

- Map nutrition competencies from Grades 1–8 across science, mathematics, language, social studies, physical education, and co-curricular learning.
- Progress from recognition in early grades to application and critical analysis in later elementary grades.
- Ensure each grade includes at least one practical food/nutrition learning experience per term.\
- Use age-appropriate outcomes rather than excessive factual content.

Pillar 2: Teacher Capacity

- Develop a short Food and Nutrition Education Teacher Guide for AJK elementary teachers.
- Include misconceptions, basic nutrition, food safety, experiential activities, and assessment.
- Integrate food and nutrition education into pre-service teacher education and in-service CPD.
- Create school-level peer-learning opportunities for sharing lesson plans and local practices.

Pillar 3: Experiential Pedagogy

- School gardens and plant-growth activities where feasible.
- Healthy lunchbox and snack-planning activities.
- Simple food preparation demonstrations subject to school safety rules.
- Food-label reading and comparison activities.
- Food tasting and sensory learning using culturally familiar foods.
- Household food diaries, budgeting activities, and reflective assignments.

Pillar 4: Healthy School Food Environment

- Promote safe drinking water.
- Develop age-appropriate healthy snack guidance.
- Reduce promotion of foods high in free sugars, salt, and unhealthy fats where policy authority permits.
- Display student-created nutrition messages in classrooms and common areas.
- Align school food practices with curriculum messages.

Pillar 5: Family and Community Engagement

- Conduct brief parent sessions on affordable nutritious foods, lunchboxes, hydration, and food safety.

- Use local food traditions as educational resources.
- Partner with health and agriculture professionals where available.
- Avoid stigmatizing families whose food choices are constrained by income or access.

Pillar 6: Monitoring and Evaluation

- Assess basic nutrition knowledge through age-appropriate quizzes.
- Assess practical skills through observation or performance tasks.
- Monitor implementation through teacher lesson records.
- Use student reflections and parent feedback to improve activities.
- Track school food-environment indicators such as water availability and healthy snack promotion.

Table 3. Suggested Grade-Band Progression

Grade band	Core competencies	Suggested activities	Assessment
Grades 1–2	Food recognition, hygiene, water, simple healthy choices	Food-group pictures; handwashing; water diary	Oral questions, matching, demonstration
Grades 3–5	Balanced diet, food sources, food safety, meal variety	Balanced plate; lunchbox design; school garden	Worksheet + performance task
Grades 6–8	Labels, portions, affordability, food marketing, critical thinking	Label comparison; budget meal; advertisement analysis	Project, rubric, reflection

DISCUSSION

The central finding of this paper is that food and nutrition education should be conceptualized as a cross-curricular life-skill competency rather than a narrow body of health facts. The international evidence indicates that elementary food-literacy programs are highly diverse, but practical and experiential approaches are repeatedly identified as promising. Pakistan evidence reinforces the need for school-based action, while also showing that nutrition education alone may not produce consistent behavior change. This strengthens the case for combining curriculum, teacher capacity, and school food-environment interventions.

For AJK, curriculum integration is particularly attractive because it can build on existing health and balanced-diet learning outcomes rather than creating a completely new subject. The National Curriculum already provides a foundation for balanced diet, food sources, hygiene, and clean water. The next step is to increase depth and application: students should not only define a balanced diet but also construct one using locally available foods; they should not only learn about food hygiene but demonstrate safe practices; and they should not only recognize healthy foods but explain how cost, advertising, culture, and availability influence choices.

The proposed framework also responds to the reality that education occurs within social and material environments. A child may possess nutrition knowledge but have limited choice at home or school. Therefore, the objective should not be to place responsibility for health entirely on children. Instead, schools should create

supportive environments and work with families and communities. This aligns with WHO's whole-school approach and provides a more equitable interpretation of nutrition education.

Another important implication concerns assessment. Traditional written tests can measure factual knowledge but may fail to capture practical competencies. Food literacy assessment should therefore include performance tasks, projects, observation, reflection, and simple scenario-based questions. For example, a student might be asked to choose a healthier snack from several options, explain the reason, compare two food labels, or design an affordable balanced lunch. Such assessment aligns learning outcomes with real-world decision-making.

Educational and Policy Implications

For Curriculum Developers

- Develop a progression of food and nutrition competencies across elementary grades.
- Embed nutrition into existing subjects rather than relying on an additional stand-alone subject.
- Include functional, interactive, and critical food-literacy outcomes.
- Ensure examples reflect AJK's local foods, cultural practices, seasons, and socioeconomic realities.

For Teacher Education Institutions

- Include food and nutrition pedagogy in elementary teacher education.
- Prepare teachers to use experiential and inquiry-based strategies.
- Develop simple, accurate, culturally responsive teaching resources.

For School Leaders

- Create a school-level nutrition action plan.
- Support practical activities within available resources.
- Coordinate healthy school food and water practices.
- Encourage parent and community participation.

For Policymakers in AJK

- Include food and nutrition education within broader education reform and school-health planning.
- Prioritize disadvantaged and remote schools in teacher training and resource provision.
- Develop minimum standards for healthy school food environments.
- Support pilot programs followed by rigorous evaluation before large-scale implementation.

RECOMMENDATIONS FOR FUTURE EMPIRICAL RESEARCH

The present evidence synthesis identifies a clear need for primary research in AJK. Future M.Phil./Ph.D. research should move from policy analysis to empirical evaluation. A mixed-methods design would be particularly suitable. Quantitative data could measure teachers' nutrition knowledge, attitudes, self-efficacy, perceived barriers, and classroom practices, while qualitative interviews could explore implementation experiences. Student-level research could examine food and nutrition literacy before and after a structured curriculum intervention.

- Conduct a curriculum content analysis of AJK elementary textbooks and teacher guides using a validated nutrition-competency framework.
- Survey elementary teachers across urban, rural, and remote schools to identify knowledge, attitudes, confidence, and perceived barriers.
- Develop and validate an age-appropriate Food and Nutrition Literacy Scale for AJK elementary students.
- Conduct a quasi-experimental intervention comparing integrated food/nutrition education with usual instruction.
- Examine whether teacher training mediates changes in classroom practice and student food-literacy outcomes.
- Evaluate the school food environment, including water access, snack availability, food marketing, and school policies.
- Include socioeconomic and geographic variables to examine equity in implementation and outcomes.

LIMITATIONS

This paper has several limitations. First, it is not a primary empirical study and therefore cannot estimate the prevalence of nutrition-literacy gaps among AJK elementary students or teachers. Second, the published literature specifically focused on AJK elementary schools is limited, requiring cautious transfer of evidence from Pakistan and international settings. Third, differences in definitions, intervention duration, outcome measures, and study quality across the literature limit direct comparison. Fourth, policy documents describe intended directions and do not necessarily demonstrate implementation at school level. These limitations reinforce the need for field-based validation of the proposed framework.

CONCLUSION

Food and nutrition education represents an important but underdeveloped opportunity within elementary education in Azad Jammu and Kashmir. The evidence indicates that schools can improve children's food and nutrition literacy, particularly when learning is teacher-supported, integrated into the existing curriculum, practical, culturally relevant, and reinforced by supportive school environments. Pakistan's nutrition challenges make this educational role especially important, while AJK's ongoing emphasis on curriculum improvement and teacher development creates a favorable policy context.

The most feasible pathway is not to add another heavily content-loaded subject. Instead, AJK should develop a coherent, cross-curricular food and nutrition literacy framework extending from early elementary recognition to later elementary application and critical thinking. Teacher professional development, experiential learning,

family engagement, healthy school food environments, and meaningful assessment should form the supporting pillars. The proposed AJK School Food and Nutrition Education Framework offers a practical starting point for curriculum planners and education researchers. Its effectiveness, however, should be tested through rigorous local research before large-scale adoption.

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