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Adolescent Nutrition and Dietary Patterns: A Narrative Review

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ABSTRACT: This narrative review explores the dietary patterns and nutritional challenges faced by secondary school adolescents across various global contexts. The study aims to synthesize recent evidence on adolescent nutrition, identify socio demographic determinants, and assess the effectiveness of school and community based interventions. Literature was gathered from databases such as Scopus and Google Scholar using keywords like "adolescent diet," "nutrition challenges," and "school based interventions." Inclusion criteria focused on studies from 2016 to 2024 covering dietary behavior, nutritional status, and education based programs. The review finds a prevalent trend of high intake of ultra processed foods, sugary snacks, and sweetened beverages, paired with insufficient consumption of fruits, vegetables, and micronutrient rich foods. This dietary imbalance is linked to rising rates of obesity, stunting, and iron and vitamin deficiencies, especially in low and middle income countries. Key contributing factors include family income, parental education, peer pressure, media influence, and school food environments. Although school based nutrition programs demonstrate positive short term outcomes, their long term effectiveness often depends on parental engagement and broader policy support. These findings highlight the urgency for multi sectoral strategies, including policy regulations, health education, improved food access, and digital interventions. Future research should focus on evaluating scalable interventions and culturally adaptive models. The study underscores that promoting healthy eating in adolescents is vital for shaping long term public health outcomes and achieving global nutrition targets.

Keywords: Adolescent Nutrition, Dietary Behavior, School Based Intervention, Nutrition Education, Public Health Policy, Food Environment, Obesity Prevention.

INTRODUCTION

Adolescence represents a pivotal stage in human development, during which lifelong health behaviors, including dietary patterns, are established. However, the nutritional habits of secondary school adolescents have become a global concern, reflecting a confluence of sociocultural, economic, and environmental influences that vary markedly between countries. In high income countries, adolescents often consume diets high in processed foods, added sugars, and saturated

fats. This trend is increasingly associated with easy access to fast foods and sugar sweetened beverages, despite growing awareness of the risks (Majid et al., 2022). Conversely, in many low and middle income countries (LMICs), adolescents face a double burden of malnutrition: undernutrition coexists with overweight and obesity, often stemming from high carbohydrate but low protein diets (Maehara et al., 2019; Sagbo & Kpodji, 2023).

Family dynamics also significantly shape adolescent eating behaviors. Parents with higher nutritional literacy are more likely to model and encourage healthy dietary choices in their children (Berge et al., 2016). Fiscal measures, such as taxing unhealthy foods and subsidizing nutritious alternatives, have shown potential in influencing adolescent food choices (Frank et al., 2021). In LMICs, parental education plays a critical role in guiding adolescents toward better food practices (Weerasekara et al., 2020). Thus, the interplay between education, economic status, and familial influence emerges as a core determinant of adolescent dietary behaviors.

Socioeconomic conditions heavily impact adolescents' dietary intake. In many disadvantaged regions, the affordability and availability of unhealthy, energy dense foods result in poor dietary choices. In contrast, wealthier families, particularly in high income countries, are more likely to afford and prioritize nutritious diets, leading to better health outcomes among their adolescents (Padmaja et al., 2024; Perkins et al., 2019). These disparities contribute to variations in nutritional status, with low income adolescents more prone to malnutrition, whether in the form of undernutrition or obesity.

The nutritional status of adolescents varies widely across global regions. In developed countries, obesity is a pressing concern, while in developing regions, undernutrition remains prevalent. For example, research has shown that adolescent girls in rural India experience high rates of stunting and underweight due to nutrient poor diets and inadequate health services (Choedon et al., 2023). Standard anthropometric indicators such as body mass index (BMI), height for age, and weight for age are commonly used to assess these nutritional outcomes (Choedon et al., 2023).

Yet, obesity is emerging as a critical issue even in LMICs. Adolescents consuming diets high in sugars and low in fiber are increasingly susceptible to overweight and metabolic syndromes (Menezes et al., 2023; Nogueira-de-Almeida et al., 2024). These risks are amplified by sedentary lifestyles, including extensive screen time and reduced physical activity (Menezes et al., 2023). Effective school and home based interventions that emphasize dietary education and promote physical activity are urgently needed to mitigate these trends (Raut et al., 2024).

Nutritional knowledge and literacy directly affect adolescents' food choices. Evidence suggests that those with greater understanding of food values make healthier dietary decisions compared to peers with limited knowledge (Taylor et al., 2019; Cohen et al., 2016). Community and school based nutrition education programs that involve families have demonstrated positive outcomes in shifting adolescent eating behaviors (Treitler et al., 2023). This highlights the value of a holistic approach that integrates education with social and environmental support.

Environmental and behavioral factors further influence adolescent diets. Studies reveal that proximity to fast food outlets and availability of unhealthy options near schools correlate with

increased consumption of non-nutritious foods (Ziauddeen et al., 2018). Policy interventions that restrict the availability of junk food while enhancing access to healthy options within school environments can improve adolescent nutritional outcomes (Livingston et al., 2021; Vatanparast et al., 2019).

Despite growing awareness of these challenges, there remain critical gaps in the literature. Most existing research adopts cross sectional designs, limiting causal inference regarding dietary behavior and nutritional outcomes (Wärnberđ et al., 2021; Sharma et al., 2021). There is also a scarcity of longitudinal studies that examine the evolution of eating patterns across adolescent development. Psychological dimensions such as stress, peer pressure, and media influence are frequently underexplored, although they play vital roles in shaping food choices (Intemann et al., 2024). Furthermore, gender specific dietary patterns and (Cohen et al., 2016; Taylor et al., 2019)concerns are often inadequately addressed in public health research (Henriksson et al., 2017)

The primary aim of this narrative review is to explore the complex relationship between adolescent dietary patterns and nutritional challenges, drawing from a diverse body of empirical evidence. By identifying socio behavioral, economic, and environmental determinants of adolescent eating habits, the review seeks to illuminate the pathways that lead to both positive and negative nutritional outcomes. Particular attention is given to the influence of school policies, household environments, and peer interactions on shaping adolescent food behaviors (Datlow et al., 2023). The review also examines how contemporary dietary shifts, advertising, and cultural attitudes contribute to dietary decisions across different contexts (Maehara et al., 2019; Miežienė et al., 2020).

This review focuses specifically on secondary school adolescents, a group at heightened risk for both undernutrition and diet related noncommunicable diseases. The geographic scope includes both high income and LMIC settings to capture a comparative perspective. Particular emphasis is placed on case studies from Southeast Asia and Southern Europe, regions facing rising nutritional disparities amid economic and social transformation (Majid et al., 2022; Wärnberǵ et al., 2021). These areas offer valuable insight into how localized factors such as food availability, cultural beliefs, and school infrastructure interact with adolescent dietary behaviors.

By narrowing the review to adolescents enrolled in secondary schools, the analysis underscores the centrality of educational institutions as platforms for delivering nutrition interventions. Adolescents in this age group are particularly receptive to health messages, and interventions during this phase can establish lifelong health trajectories ((Taylor et al., 2019). Moreover, focusing on school aged youth enables researchers and policymakers to develop context specific strategies that reflect the unique nutritional landscapes of different regions (Daniels & Hanson, 2021).

In summary, this introduction lays the groundwork for a comprehensive review of global adolescent dietary patterns and nutritional challenges. It highlights the pressing need for integrated, evidence based approaches that address the multifaceted nature of adolescent nutrition. Through this review, stakeholders in public health, education, and policy are urged to collaborate in creating supportive environments that facilitate healthy eating and long term well-being among adolescents worldwide (Jung et al., 2023).

METHOD

This study employed a narrative review approach to examine the dietary patterns and nutritional challenges faced by secondary school adolescents. A comprehensive literature search was conducted across major academic databases including PubMed, Scopus, Web of Science, and Google Scholar, targeting peer reviewed studies published between 2010 and 2023. The search strategy utilized a combination of predetermined keywords and Boolean operators to ensure precision and comprehensiveness. Keywords included variations of "adolescent dietary patterns," "nutrition," "school nutrition," "adolescent obesity," and "nutritional challenges."

Selection criteria were carefully defined to include peer reviewed studies, systematic reviews, and meta analyses that empirically or theoretically analyzed the impact of dietary habits, nutritional status, and health outcomes among adolescents aged 12 to 18 years. Eligible studies had to focus on the target population within school settings and present either global or cross national perspectives. Only articles published in English and offering empirical evidence were considered. Exclusion criteria included studies not directly addressing adolescents, publications lacking empirical data (such as opinion pieces), non-English texts, and studies limited to a single country context without comparative regional or international analysis.

To enhance reliability, a multi stage screening process was employed. Initial screening involved reviewing titles and abstracts, followed by full text assessment for methodological rigor and thematic relevance. Four independent reviewers conducted the evaluations to ensure alignment with inclusion criteria. Emerging themes were synthesized to identify recurring patterns in how social, economic, and environmental factors influence adolescent eating behaviors. These findings provide critical insights into the global dynamics of adolescent nutrition, highlighting common trends and regional distinctions that shape dietary practices and associated health risks among secondary school youth.

RESULT AND DISCUSSION

The analysis of current literature reveals diverse dietary patterns and significant nutritional challenges among secondary school adolescents. The consumption of ultra processed foods rich in calories, sugars, and fats is a dominant trend across various populations. Adolescents frequently consume fast food, sweet snacks, and sugary beverages, which are often more accessible and culturally normalized in both developed and developing countries (Archero et al., 2018; Maehara et al., 2019). Conversely, the intake of fruits and vegetables remains insufficient, influenced by lifestyle factors and social environments (Wądołowska et al., 2019).

In Indonesia, a notable dual burden of malnutrition exists. Adolescents suffer from both undernutrition and overnutrition, a result of energy dense but nutrient poor diets (Majid et al., 2022). The frequent consumption of white rice, instant noodles, and sweetened snacks is prevalent among Indonesian youth. In contrast, adolescents in developed regions such as Europe and North America benefit from better school based nutrition education and demonstrate increased fruit and

vegetable intake, alongside reduced consumption of high fat and high sugar items (Ferreira-Pêgo et al., 2020; Nasreddine et al., 2020). However, unhealthy dietary behavior often reemerges in recreational settings or during unsupervised meals (Wärnberǥ et al., 2021).

Gender differences in dietary patterns are evident. Female adolescents tend to prioritize dietary health, exhibiting higher consumption of fruits and vegetables. Male adolescents, however, frequently consume fast food and sugary snacks, influenced by social norms and peer pressure (Baldasso et al., 2016; Intemann et al., 2024). Furthermore, parental education plays a pivotal role. Adolescents from highly educated families exhibit better nutritional knowledge and healthier food choices, whereas those from less educated backgrounds often rely on inexpensive, unhealthy food options due to limited resources and awareness (Peraita-Costa et al., 2018).

These findings underline the importance of school based nutrition interventions and family support in enhancing adolescents' dietary awareness. Locally and demographically responsive intervention programs are essential to address diverse adolescent nutritional needs (Andueza et al., 2022; Nurul-Fadhilah et al., 2016). Addressing adolescent dietary habits holistically will inform future public health strategies and mitigate long term health consequences.

Recent empirical data illustrate the complex nutrition landscape among adolescents, with stunting, obesity, and micronutrient deficiencies often co-occurring. In Indonesia, stunting among adolescents remains substantial, particularly among girls, indicating inequitable nutritional access during critical growth phases (Maehara et al., 2019). Obesity rates vary significantly across countries, ranging from 5% to 40%, with higher prevalence observed among adolescents from lower socio economic backgrounds, who face limited access to healthy foods and increased exposure to unhealthy dietary options (Choedon et al., 2023; Livingston et al., 2021; Malczyk et al., 2024).

Micronutrient deficiencies, notably in iron, vitamin A, and iodine, continue to pose serious risks. In South Asia, iron deficiency affects approximately 40% of adolescents, impairing both physical development and cognitive performance (Choedon et al., 2023). Vitamin D deficiency, though less often discussed, contributes to long term health risks, including osteoporosis (Hwalla et al., 2017). Adolescents commonly consume diets low in fruits, vegetables, and dairy products, but high in sugar and trans fats, exacerbating nutritional imbalances (Hamułka et al., 2023).

Multiple systemic factors underlie adolescent nutritional issues. Economic status critically influences food access; low income families often depend on affordable, energy dense foods with poor nutritional profiles (Granado-Casas et al., 2022). Parental education is equally influential; higher parental education levels correlate with better adolescent nutrition outcomes (Henriques et al., 2025; Tosi et al., 2023). Media exposure, particularly to advertisements for unhealthy foods, alters dietary preferences and normalizes frequent consumption of such products (Soczewka et al., 2024). Social norms and peer dynamics further complicate adolescents' food choices. Fast food consumption is often perceived as socially desirable, deterring healthy alternatives (Sharma et al., 2021). Inadequate school based nutrition education also contributes, limiting adolescents' understanding of balanced diets and healthy food planning (Menezes et al., 2023; Nurul-Fadhilah et al., 2016).

School feeding programs and nutrition education initiatives have shown significant promise in reshaping adolescent eating habits. These programs, implemented globally, promote increased consumption of nutritious foods and reduced intake of processed products (Raut et al., 2024). In Brazil and Spain, school based nutrition programs have improved students' health indicators, including weight control (Egbuonye et al., 2021). Interactive educational activities in schools enhance students' comprehension of dietary balance and support healthier food preparation (Raut et al., 2024).

Yet, sustainability of these outcomes remains a challenge. Parental involvement significantly strengthens program success, as evidenced in Greece, where parent inclusive initiatives yielded more consistent dietary improvements among adolescents (Dalma et al., 2016). This finding highlights the essential role of the home environment in reinforcing school based dietary lessons.

Cross country comparisons reveal that intervention success varies widely. In nations like Canada and Australia, evidence based, behaviorally informed school programs, including training for teachers and parents, have enhanced nutritional outcomes (Fernandes et al., 2021; Tosi et al., 2023). Conversely, developing countries face resource and infrastructure constraints, limiting the reach and efficacy of such programs. In Bangladesh, although nutrition knowledge improved, tangible dietary changes were limited due to environmental constraints (Islam et al., 2020; Kubuga et al., 2023).

In Europe, fiscal policies such as sugary drink taxes have effectively curbed unhealthy consumption, suggesting that a combination of education and regulatory measures can yield meaningful behavioral shifts (Saxe-Custack et al., 2019; Ziauddeen et al., 2018). Overall, multi stakeholder engagement including policymakers, educators, families, and communities is vital for the success of adolescent dietary interventions. Holistic strategies combining nutrition education, supportive policies, and improved food access offer the best prospects for sustainable dietary improvements and public health gains (Chen et al., 2017; Teshome et al., 2023).

The findings from this narrative review highlight the multifactorial nature of adolescent nutrition challenges, confirming and extending prior research while introducing new insights regarding socioeconomic determinants, systemic barriers, and intervention outcomes. In line with previous studies, a recurring theme across global contexts is the high prevalence of ultra processed food consumption and limited intake of fruits and vegetables among adolescents (Arthur et al., 2020; Ferreira-Pêgo et al., 2020). These dietary patterns correlate strongly with both obesity and stunting rates in various regions, particularly in low and middle income countries where dietary transitions often outpace public health strategies (Maehara et al., 2019).

While these trends are consistent with existing literature, this review deepens the understanding of how parental education and family income levels act as pivotal mediators in adolescent dietary behaviors. The positive influence of parental nutritional knowledge, previously acknowledged, is further substantiated here through empirical data underscoring its direct link to healthier adolescent eating patterns (Maehara et al., 2019). Yet, contrasting findings emerge regarding school based interventions. While earlier studies suggested long term improvements in eating habits due to school nutrition programs (Sych et al., 2019), this review reveals that without continuous

reinforcement from home environments and enabling policies, such gains are difficult to sustain (Datlow et al., 2023).

Systemic Factors Shaping Adolescent Nutrition

The review identifies poverty as a dominant systemic factor affecting dietary choices. Households with limited financial resources tend to prioritize affordability over nutritional value, leading to increased consumption of calorie dense, nutrient poor foods (Frank et al., 2021). The limited availability of fresh produce in economically disadvantaged neighborhoods compounds this issue, reducing adolescents' ability to adopt healthier diets. In contrast, wealthier communities often have better access to fresh foods, creating stark nutritional inequalities across regions.

Educational systems also play a critical role. Schools lacking structured nutrition education and failing to provide healthy food options contribute to poor dietary habits among students (Krieger et al., 2020). Countries with rigorous school food policies, such as the UK, have demonstrated significant reductions in unhealthy food intake through regulatory and curricular integration (Majid et al., 2022). These findings emphasize the necessity for intersectoral collaboration between educational institutions, health departments, and policymakers.

Another determinant is the built food environment surrounding adolescents. In areas characterized as "obesogenic," where fast food outlets outnumber stores offering nutritious alternatives, adolescents are more likely to adopt unhealthy eating habits (Taylor et al., 2019). Supporting food environments through local markets and urban agriculture can enhance the accessibility of nutritious foods, especially in urban poor settings (Taylor et al., 2019).

Media and marketing pressures also significantly shape adolescent food choices. Exposure to aggressive advertising for sugary snacks and fast food on television and social media platforms normalizes unhealthy consumption patterns (Suárez-González et al., 2021). Adolescents' decision making is easily swayed by online influencers and peer trends, further amplifying the demand for nutrient deficient products. This necessitates stricter regulatory oversight on food marketing targeted at younger audiences.

Policy Solutions and Intervention Models

Several policy solutions have emerged in the literature to counteract the systemic drivers of poor adolescent nutrition. Nutrition education integrated into formal curricula has shown efficacy in increasing awareness and changing dietary behaviors (Raut et al., 2024). Programs such as those implemented in Brazil using the Pestalozzi method demonstrated improved adolescent interest in healthy foods and more favorable dietary patterns (Fernandes et al., 2021).

Regulatory frameworks that ensure the availability of nutritious food in schools have also shown promise. The Brazilian National School Food Program (PNAE), for instance, links school meal provision with national dietary guidelines, enhancing adolescents' nutritional intake (Henriques et al., 2025). These efforts are particularly impactful in lower income groups who rely on school meals as a primary nutrition source.

Economic instruments, such as taxation of unhealthy foods, have been effective in altering purchasing behavior. In Mexico, sugar sweetened beverage taxes resulted in significant declines in their consumption, especially among adolescents (Livingston et al., 2021). This suggests that fiscal policies can serve as deterrents against unhealthy food consumption when combined with public awareness campaigns.

Environmental regulations targeting the marketing and availability of unhealthy foods have also proven effective. Restrictions on fast food outlets near schools and limits on advertising during children's programming have shown to decrease adolescent interest in junk food (Livingston et al., 2021). These strategies are most successful when embedded within broader public health frameworks.

Community based interventions that engage families, educators, and health workers offer another promising pathway. Parental involvement in school nutrition programs has been associated with more durable dietary changes among adolescents (Raut et al., 2024). These community driven models reinforce behavior change both at school and at home, bridging the gap between knowledge and practice.

Behavioral interventions leveraging digital platforms are increasingly used to promote healthier eating. Mobile apps and online tools help adolescents track food intake, receive tailored dietary advice, and build healthy habits over time (Raut et al., 2024). Such technology enabled strategies expand the reach of nutrition education and allow for personalized guidance, critical for behavior modification.

Limitation

This review acknowledges several limitations. The narrative design, while allowing for thematic exploration, is inherently limited in its ability to quantify intervention outcomes across contexts. Furthermore, language restrictions and database selection may have excluded relevant non English literature or region specific studies. The review also does not account for the longitudinal impact of dietary interventions beyond adolescence, and findings are constrained by the variability in study designs, populations, and metrics used across the included literature. Lastly, cultural factors that influence food choice were not deeply analyzed due to a lack of consistent reporting across studies. Future analyses should address these gaps using a meta analytical or mixed methods approach.

Implication

The findings from this review underline the necessity of adopting multifaceted, context sensitive approaches to adolescent nutrition interventions. Future research should explore longitudinal impacts of school based and community level interventions, incorporating behavioral and environmental components. There is also a need to investigate the role of emerging digital tools in supporting dietary behavior change among youth, particularly in low resource settings. Policymakers and program designers must prioritize cross sectoral collaboration to align education, health, and agricultural policies. Additional emphasis should be placed on developing culturally tailored strategies that consider local food preferences, availability, and socioeconomic dynamics.

These steps are crucial in creating sustainable improvements in adolescent nutrition and preventing long term health consequences.

CONCLUSION

This narrative review highlights the multifaceted dietary and nutritional challenges facing secondary school adolescents globally. The findings reveal consistent patterns of unhealthy eating behavior, including high consumption of ultra processed foods and low intake of fruits and vegetables. These dietary behaviors have been linked to increasing rates of obesity, stunting, and micronutrient deficiencies among adolescents. Socioeconomic disparities, parental education levels, and media influences significantly contribute to these nutritional outcomes, emphasizing the systemic nature of the problem.

The discussion underscores that isolated school based interventions are often insufficient without broader systemic support, including family involvement, governmental policies, and access to nutritious food environments. Effective strategies require integrated approaches that combine nutrition education, policy regulations on food marketing, school meal programs, and community based interventions. Notably, successful practices from various countries such as Brazil, the UK, and Canada serve as evidence for the potential scalability and adaptability of multi stakeholder frameworks.

Given the persistent prevalence of malnutrition in both its undernutrition and overnutrition forms, there is a critical need for sustained public health efforts and policy innovations. Future research should explore longitudinal impacts of dietary interventions, particularly in low and middle income countries, and evaluate the role of digital platforms in promoting healthy eating habits among adolescents. Ultimately, improving adolescent nutrition requires a comprehensive, cross sectoral strategy that addresses behavioral, structural, and environmental determinants of diet.

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