



Position paper

Addressing Nutritional Disorders in Adolescents

 The Society for Adolescent Health and Medicine



Adolescence is a unique period of nutritional vulnerability. The complex hormonal interplay necessary for normal pubertal development, linear growth, and neurodevelopmental changes cannot occur without adequate nutritional fuel [1]. Adolescent-specific recommendations for nutritional intake differ significantly from adult or child recommendations [2]. Unfortunately, millions of adolescents in both high-income countries (HICs) and low- and middle-income countries (LMICs) suffer from nutritional disorders [1]. Factors contributing to nutritional disorders in adolescence include poverty, child maltreatment, political upheaval, socio-cultural influences, and inequitable access to education and health care. Nutritional behavior may be affected by expected developmental and behavioral changes of adolescence, including increased influence from peers and media, evolution of sociocultural beliefs, and body consciousness. The World Health Organization discusses adolescence as a critical period for intervention to improve current, future, and intergenerational nutritional health [3].

Nutritional Disorders

Millions of adolescents in both HICs and LMICs suffer from underweight, resulting in potentially permanent growth stunting, delayed puberty, cognitive impairment, decreased school/work productivity, and death [1]. Overweight in adolescence, however, increases cardiorespiratory and metabolic morbidity in adulthood and premature mortality [4]. Overweight affects one in five adolescents in HICs, in LMICs, the prevalence is one in 10 and is increasing faster than in HICs [5].

Weight alone is an incomplete proxy for nutritional health. The leading global cause of disability in adolescents is iron deficiency anemia, affecting 20.8% of LMIC adolescents and 18.0% of HIC adolescents [6]. Iron deficiency anemia in adolescence interferes with physical and cognitive growth, impairing capacity for physical work and learning. Common contributors include inadequate dietary iron, higher iron requirements during puberty, menstrual losses in girls, and parasitic infections [6]. Overweight adolescents are at higher risk of iron deficiency and may have decreased

response to iron supplementation, possibly from adiposity-related inflammation reducing availability and absorption of iron and earlier onset of menstrual losses in overweight girls [7].

Dietary calcium requirements are highest during adolescence, when approximately 40%–60% of adult bone mass is accrued [8]. However, among 14–18 year olds in the United States, only 42% of boys and 13% of girls consume adequate amounts of dietary calcium [9]. In LMICs, where dairy products and fortified foods are less accessible than in HICs, the average calcium intake among adolescents is less than half of that among American adolescents [10]. Vitamin D, which is primarily obtained by humans through cutaneous synthesis from sunlight exposure, is necessary for most dietary calcium absorption [8]. Unfortunately, even in nations with abundant sunshine, there is a high prevalence of vitamin D deficiency among adolescents; risk factors that reduce cutaneous synthesis include darker skin pigmentation, obesity, covered clothing style, and time spent indoors [11]. Therefore, vitamin D from fortified foods or supplementation is recommended for all adolescents [8]; however, less than half of adolescents in either HICs or LMICs consume adequate dietary vitamin D [9,10].

Other micronutrient deficiencies contributing to significant morbidity among adolescents (especially in LMICs) include folic acid, iodine, vitamin A, and zinc deficiencies; these are priority targets for intervention by the Centers for Disease Control and Prevention [12].

Intergenerational Transmission of Nutritional Disorders

Every year, 16 million girls aged 15–19 years and another 1 million girls under age 15 years give birth, accounting for over 10% of births worldwide [13]. Over 90% of adolescent births occur in LMICs. Low or high prepregnancy body mass index and micronutrient deficiencies during pregnancy are associated with increased maternal and infant mortality [14]. Adolescent girls frequently experience growth stunting and weight loss during pregnancy and are at higher risk of iron and calcium deficiency than older women due to increased maternal–fetal competition for nutrients. Growth stunting and micronutrient deficiency contribute to gestational hypertension, obstructed labor, and delivery of premature and/or low-weight infants [5]. Fetal growth restriction from inadequate prenatal nutrition leads to both growth stunting and rapid weight gain in childhood, which

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frequently persist into adolescence and adulthood [14], thus perpetuating the vicious cycle of nutritional disorders.

Intergenerational transmission of malnutrition is also influenced by sociocultural factors. These include gender inequality, resulting in poorer nutritional status and nutrition literacy among young mothers; intergenerational perpetuation of poverty and food insecurity; and the common cultural practice of "eating down" (i.e., eating less) during pregnancy to avoid delivering large babies [15].

Nutrition Screening

The Society for Adolescent Health and Medicine recommends annual health surveillance assessments for all adolescents [16]. Adolescents should receive initial nutritional screening with anticipatory guidance and brief intervention as part of their annual health surveillance visits. Initial screening should include measurement of height, weight, and body mass index plotted on population-based growth curves; basic dietary pattern, including frequency of meals and variety of foods consumed; beverage consumption, particularly sweetened or caffeinated beverages and alcohol; and quantification of physical activity and screen time. Any provider with skill in adolescent history taking and an understanding of adolescent growth and development, including a physician, nurse practitioner, nurse, physician assistant, registered dietitian/nutritionist (RDN), or accredited social health activist, may perform initial nutritional screening.

Nutritional risk identified in initial screening should prompt more detailed assessment. Screening should ideally be performed by an RDN, but if unavailable, screening may be performed by another health professional with training in adolescent nutrition and access to RDN consultation. Using a culturally sensitive, compassionate and nonjudgmental approach, detail should be elicited about portion sizes, weight control behaviors and/or binge eating, body image, and influence of peers and media on diet. Family meal routines, food preparation methods, grocery shopping routines, and effects of culture and religion on nutrition and physical activity should be explored. Food security should be sensitively assessed. Among adolescents at nutritional risk, providers should consider performing laboratory investigations to assess both effects (e.g., anemia, micronutrient deficiency, dyslipidemia, insulin resistance, decreased bone density, and delayed bone age) and possible organic causes (e.g., inflammatory conditions, malabsorption, and malignancy) of poor nutritional status.

Pregnant adolescents warrant detailed nutritional screening at their first prenatal health care encounters and should be nutritionally reassessed at every health care visit.

Management of Nutritional Disorders

Adolescents with nutritional disorders should ideally be referred to an adolescent-specific multidisciplinary team, including a physician or nurse practitioner, RDN, and mental health provider. However, if multidisciplinary resources are not available or if their costs outweigh their benefits, a single provider with expertise in adolescent nutrition may provide effective management; if the provider is not an RDN, access to RDN consultation is important for effective care.

Providers should use a balanced approach for counseling all adolescents with nutritional disorders about healthy eating and activity, regardless of weight status. Many providers mistakenly

encourage underweight patients to eat high-calorie but nutrient-poor foods and avoid physical activity, while encouraging overweight patients to restrict portion sizes, eliminate "bad foods," and exercise more. Weight-based approaches to nutritional counseling, not only in health care settings but also in school curricula and public health campaigns, may inadvertently encourage disordered eating such as binge eating, excessive dietary restriction, overexercise, and purging [17].

Providers should explain that nutritional patterns (including eating every 3–4 hours, including all food groups in appropriate proportions, and enjoying regular physical activity) are more important than individual foods eaten. Adolescents should be reminded that there are no "good foods" or "bad foods"; such dichotomization is overgeneralized and ineffective. Providers should encourage adolescents to critically evaluate nutritional claims from peers, the media, and the food industry.

The Academy of Nutrition and Dietetics states that the "total diet," or overall pattern of eating over time, is the most important determinant of nutritional health. The Academy of Nutrition and Dietetics contends that "all foods can fit within this pattern if consumed in moderation with appropriate portion size and combined with physical activity" [18]. The "total diet" approach is consistent with recommendations by multiple professional organizations for nutritional disorders in adults [18]; while it has not been evaluated in adolescents, its principles may inform balanced approaches to adolescent nutritional counseling.

Providers should consider that adolescents experiencing food insecurity may be unable to consistently follow recommendations for regular eating patterns or inclusion of all food groups. However, abnormal patterns of eating because of food deprivation can lead to disordered eating, either through perpetuation of dietary restriction or urges to binge when food is available. Providers should acknowledge the constraints generated by food insecurity, while working with adolescents to adopt the healthiest pattern of eating that can be reasonably achieved with available resources.

Providers should screen adolescents for exclusionary diets. Exclusionary diets may be medically, culturally, or religiously necessary; however, diets excluding entire nutritional subgroups are commonly employed as socially acceptable forms of dietary restriction [19]. Examples of this include elimination of all animal products, gluten, dairy, or fats. There are many purported reasons for adopting exclusionary diets, including the belief that a nutritional subgroup is "unhealthy," animal rights, peer pressure, social trends, or weight loss. Exclusionary diets should be discouraged during adolescence in the absence of medical, cultural, or religious necessity. Adolescents and parents should be counseled that it is only the combination of all food groups that provides all nutrients necessary for health, and that exclusionary diets could lead to micronutrient, macronutrient, or energy deficiencies that may be particularly damaging during periods of growth.

Micronutrient supplementation should be offered to adolescents who consume inadequate quantities through diet alone, or who have biochemical or clinical evidence of micronutrient deficiency.

Advocacy

Because nutritional health is influenced by many entities, including health care systems, education systems, policymakers, and industry, improving nutritional health in adolescents requires collaboration from many stakeholders. School-based programs,

particularly those that provide micronutrient supplementation, promote balanced dietary habits, and mandate physical activity, are particularly effective and accessible for adolescents [20]. Food security and nutrition education programs by government, public health, and community groups are essential for many adolescents [5]. Community leaders should be recruited to communicate culturally and religiously relevant nutritional messages to those they represent. Providers should identify and support key community drivers of change.

In HICs, access to RDN services is highly variable due to variability in insurance reimbursement, unequal geographic distribution of RDNs, and other social inequities such as poverty or lack of transportation limiting access to these professionals. Providers should advocate for access to RDN services for adolescents of all socioeconomic backgrounds. In LMICs, access to RDN services is compromised by a more fundamental problem: a scarcity of RDNs, regardless of whether their services are reimbursed. According to a recent survey of 41 nations [21], the number of RDNs in relation to the overall population ranged from more than 30 per 100,000 people in Japan, Norway, and Denmark to 0.1 per 100,000 people in Pakistan; one quarter of nations reported less than one RDN per 100,000 people. All nations must prioritize the development of regional RDN training programs.

Future Research

There are no validated general adolescent nutrition screening tools for ambulatory use. Development of such tools would better allow providers without specific expertise in adolescent nutrition to detect adolescents with nutritional disorders and refer them for management.

More research is needed on how psychosocial and emotional factors relate to nutritional disorders in adolescence, and implications for prevention and treatment. For example, obesity and depression are strongly associated with adolescents, but studies of one disease often specifically exclude the presence of the other; studies are needed to understand how treatment of comorbid depression can affect weight management [22]. Similarly, studies in both HICs and LMICs have demonstrated a relationship between poor family functioning and obesity; however, the directionality of this relationship, influence from gender roles and cultural differences, and application to clinical management are poorly understood [23]. Research is needed to explore how other social determinants of health, such as adverse childhood events or toxic stress from social inequality, contribute to nutritional disorders in adolescence. Researchers should investigate strategies for avoiding pitfalls of weight-based nutritional counseling, which may inadvertently encourage disordered eating [17]. The "total diet" approach, which is recommended for adults regardless of weight [18], warrants further evaluation in adolescents specifically.

Most intervention studies for obesity and eating disorders have been performed in HICs, while most intervention studies for micronutrient deficiencies have been performed in LMICs [24]. Future studies should identify regionally and culturally relevant interventions for all nutritional disorders in every nation. The World Health Organization contends that there is sufficient evidence to recommend global implementation of several population-based interventions, including taxes on sugar-sweetened beverages; limitations on marketing of sugar-sweetened beverages to children and adolescents; global standards for nutrition provided in schools; urban planning prioritizing safe public areas

for physical activity, including gender-friendly spaces; increased access to nutrient-rich foods in disadvantaged neighborhoods; and a standardized global system for nutritional labeling [25]. In practice, these policies have been adopted in an inconsistent fashion, typically on a municipal rather than national or international level. Funding should be directed toward the implementation and evaluation of these policies on a large scale.

The role of technology should be explored in supporting nutritional treatment and prevention through apps, social media, physical activity monitoring devices, and telemedicine. Interventions to prevent adolescent pregnancy are critical to break the vicious cycle of child and adolescent nutritional disorders in LMICs; researchers should simultaneously develop prenatal nutrition education tools targeting adolescent mothers, employing adolescent-friendly media for dissemination.

Summary

Adolescence is a critical point of intervention for current, future, and intergenerational nutritional health. Providers should screen adolescents comprehensively for nutritional risk, make timely referrals, and initiate developmentally appropriate interventions. However, the biggest impact on adolescent nutritional health may come from large population-based interventions aiming to prevent adolescent nutritional disorders and their intergenerational perpetuation, addressing a broad spectrum of nutritional issues that goes beyond weight status alone. Providers must engage in advocacy directed at all societal stakeholders who can influence adolescent nutritional health.

Executive Summary

Nutritional disorders in adolescence contribute to morbidity and mortality in both high-income countries (HICs) and low- and middle-income countries (LMICs). Adolescence has been identified as a critical point of intervention for current, future, and intergenerational nutritional health. The Society for Adolescent Health and Medicine takes the following positions:

- 1 Adolescents should ideally receive nutritional screening at least once per year by a skilled health care provider.
- 2 Nutritional disorders in adolescence, including unhealthy weight status and/or nutritional deficiency (e.g., inadequate energy, macronutrient, and/or micronutrient intake), contribute globally to morbidity and mortality and should be targets of intervention.
- 3 Providers should recognize that nutritional disorders in adolescence may significantly impact the health of subsequent generations, particularly in LMICs.
- 4 Ideally, adolescents with nutritional disorders should be referred to a multidisciplinary management team; if this is not feasible, a single provider with expertise in adolescent nutrition may provide effective management. Management should incorporate an understanding of normal adolescent development, principles of motivational interviewing, effective goal setting and problem solving, and cultural competency.
- 5 Providers should have a balanced and unified approach for counseling all adolescents with nutritional disorders—regardless of weight—about healthy patterns of eating and activity.
- 6 Exclusionary diets that are not medically, religiously, or culturally necessary should be discouraged during adolescence.
- 7 Schools, public health organizations, governments, and community groups have a critical role in preventing and treating nutritional

disorders in adolescence; health care providers should identify key stakeholders in their communities and support them in their efforts.

- 8 Providers should advocate for improved access to, and reimbursement of, dietitian services for adolescents in HICs and LMICs.
- 9 Future research efforts should explore effective interventions targeting adolescent nutritional screening, psychosocial determinants of nutritional disorders, cultural contributors to nutritional disorders in both HICs and LMICs, public health strategies, and the use of technology in treatment and prevention.

Disclosures

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