High School Nutrition Education Modules for Homeschooling

HIGH SCHOOL NUTRITION EDUCATION MODULES FOR HOMESCHOOLING

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Introduction

The increasing prevalence of obesity impacts both the adult population and the adolescent population.[1] Conditions such as type 2 diabetes mellitus (T2DM), hypertension (HTN), nonalcoholic fatty liver disease (NAFLD), obstructive sleep apnea, and dyslipidemia were once considered adult diseases. However, recently, these conditions are developing at younger ages.[2] Globally, overweight and obesity affect one in every three adolescents.[3] Within the past 30 years, the percentage of obese 12 – 19 year-olds increased from 5 to 18%.[4] Obesity is multifactorial and related to environmental, genetic, and ecological factors.[2] However, childhood obesity is likely the result of a positive energy balance due to increased energy intake and decreased energy expenditure.[1,2] Children with severe obesity and a family history of obesity will likely struggle with obesity and related comorbidities into adulthood.[2] Upwards of 50% of adolescents with obesity will remain so throughout adulthood.[1]

Nutrition Requirements

Nutritional requirements are increased during adolescence due to rapid physiological, sexual, neurological, and behavioral growth.[5] Therefore, health behaviors during adolescence can have short and long-term effects.[1] Hormonal changes during adolescence alter the proportions of muscle and fat mass in the body; inadequate nutrition can delay growth and maturation.[3] The evidence suggests that obesity contributes to the early initiation of puberty in females, but there is inadequate data for males.[6] Some national data suggest that adolescents are at risk for chronic diseases related to diets consisting of increased fat, sodium, and sugars combined with decreased consumption of fruits, vegetables, and high fiber or calcium-containing foods. [1]

The recommended intake of saturated and total fat for adolescents is less than 10% of total energy from saturated fat and no more than 30% of total fat.[1] However, less than 50% of

adolescents aged 12 to 19 meet these recommendations regardless of socioeconomic status or race.[1] Adolescents consume more than the daily recommendation of less than or equal to 2,400 mg of sodium.[1] In 1999, the Youth Risk Behavior Surveillance Survey (YRBSS) reported that fewer than 25% of students aged 14 – 18 ate at least five servings of fruits and vegetables daily.[1] More recent reports note that 7.1% of adolescents meet USDA intake recommendations for fruits and 2.0% for vegetables.[7] The excessive intake of total fat, saturated fat, sodium, and low fiber intake is likely due to the inadequate intake of fruits and vegetables, putting adolescents at an increased risk of deficiencies.[1]

Common Adolescent Deficiencies

Adolescents are not as concerned with reducing risk factors or preventing chronic diseases.[8] Reduced nutrient consumption in adolescence can affect height, adiposity, and health status.[9] Energy requirements are increased during puberty, requiring a greater intake of protein, calcium, and other vitamins and minerals to gain muscle and bone mass.[8] While adolescence is generally considered a healthy period, many non-communicable diseases (NCD) that manifest later are associated with modifiable risk factors established during this time.[10] Adolescence is a crucial period to modify intake and activity because adolescents are not commonly concerned about how their diet can prevent diseases or affects risk factors for NCD.[8]

Adipose tissue is necessary to cushion and insulate vital organs and produces hormones in the body; it can be classified as subcutaneous or visceral. Subcutaneous adipose tissue is located beneath the skin, whereas visceral lines internal organs. Excess visceral adipose tissue is associated with increased metabolic and mortality risk.[11] Visceral obesity may reduce bone quality compared to subcutaneous adipose tissue.[12] During puberty and adolescence, growth in height and bone mineral accumulation is rapid, reaching a peak shortly after the maximal height is obtained.[12] To

reduce the risk of osteoporosis in women, adolescent girls should be taught healthy nutritional behaviors.[8] Calcium is crucial for bone mineralization, and the dietary guidelines for calcium are not being met by all children and adolescents.[1,8,12] Less than half of individuals aged 12 – 19 consume the recommended number of servings of dairy, perhaps related to an increase in the consumption of sugar-sweetened beverages.[1] Furthermore, soft drinks contain phosphoric acid, which may increase bone resorption, and caffeine, which may increase calcium excretion.[1] Vitamin D is also crucial to bone health and calcium and phosphorus metabolism, with approximately 14% of adolescents aged 12 – 19 deficient.[13] Additionally, Vitamin D deficiency is more common in obesity, which can decrease insulin secretion and sensitivity.[13]

An additional concern for adolescent girls is iron deficiency anemia. This condition may cause fatigue, reduced attention, and impaired cognitive function and could affect 2 – 4% of adolescent females.[1] Rapid growth, menstrual blood loss, and inadequate dietary intake of iron contribute to this prevalence of iron deficiency.[14] The recommended dietary allowance for iron is 15 mg, and the average iron intake of females aged 12 to 19 years is less than 12 mg.[1]

Physical Activity

Adolescent physical inactivity may contribute to cardiometabolic and mental health disorders.[10] The World Health Organization (WHO) recommends that individuals under the age of 18 participate in an average of 60 minutes of moderate-to-vigorous intensity physical activity daily; only 20% of adolescents are classified as sufficiently active.[10] The 80% of insufficiently active adolescents spend at least two hours daily on recreational screen time.[10] With the advancement and increased use of technology in recent years, there has been an overall increase in sedentary lifestyles.[4] The WHO does not offer screen-time cutoff recommendations for older children and adolescents.[15] However, the American Academy of Pediatrics (AAP) recommends

avoiding screen time during meals, at least 30 minutes before going to bed and utilizing parental controls to ensure age-appropriate content.[15] As children reach adolescence, physical activity declines, particularly in females.[1] In neighborhoods with high crime rates, adolescent females are 26% less likely to engage in physical activity and are at an increased risk of becoming overweight or obese.[16] There is no significant association between high-crime neighborhoods and adolescent males.[16] Unsafe neighborhoods may also lead to decreased active commuting to school. Furthermore, schools do not prioritize financial support for physical education classes, breaks, and playgrounds.[17]

Psychosocial Implications

Obesity is associated with a greater risk of anxiety and depression in adolescents as they may face peer discrimination or rejection, potentially resulting in low self-esteem.[18] Furthermore, overweight or obese adolescents may decline to participate in physical activities in and out of school settings due to low self-esteem or limited mobility.[1] Increased use of social media can further hinder adolescent health as it is associated with greater rates of body dissatisfaction and eating disorder symptoms.[19,20] Physical, mental, and social changes that are rapidly occurring may cause the prevalence and severity of disordered eating to peak during adolescence.[1] Eating disorders such as anorexia nervosa and bulimia nervosa can be severe enough to require medical treatment and can result in death.[1] Approximately 10 – 20% of adolescent females express distorted eating tendencies; however, they are not severe enough for a diagnosis of anorexia or bulimia.[1] Adolescent males also suffer from body dysmorphia and distorted eating patterns. 30% of adolescent males have reported attempts to gain weight, including 40% of males being classified as having a normal BMI.[20]

Nutrition Education

Adolescence presents an optimal time to influence eating patterns and nutritional status, with the intent to positively impact future health status.[21] Nutrition education is an essential part of behavior change theories.[22] Public health initiatives are the cornerstone to alter the course of the continuous rise in obesity.[23] Many high school-aged students are not familiar with the principles of nutrition.[24] General nutrition knowledge questionnaires demonstrate that students receive inadequate nutrition education, which hinders growth and disease prevention when accompanied by unsatisfactory nutritional behavior.[8] Effective nutrition education implemented in schools is highly recommended to increase nutrition knowledge and produce behavior change.[8] A 2019 study demonstrated that two 45-minute nutrition education interventions using food models significantly improved adolescents' food and sugar literacy.[22] Furthermore, a 12-week nutrition e-learning course yielded significant improvements in the knowledge of dietary recommendations and desired food choices.[8] Age-appropriate activities in successful nutrition interventions included the use of topics important to the adolescent. For example, explaining the impact of a diet rich in fruits and vegetables on improved skin integrity and body image has been seen to be more effective than a health-based intervention.[25]

As a form of secondary education, homeschooling is growing in popularity in the United States.[26] The home school environment is an excellent opportunity for family-based intervention, which is the basis of weight management in children by involving the entire family in dietary modifications and increased physical activity.[2] Parent modeling, feeding styles, or availability of food significantly affect health and dietary behaviors before children reach adolescence; therefore, adolescent interventions incorporating the school and the home environment may effectively promote healthy lifestyle choices.[25] Parents and family members who actively participate by

accompanying their students during cooking, tasting, and nutrition education sessions are more successful in positively modifying dietary behaviors and anthropometrics.[25] Nutrition education integrated into the required homeschool curriculum can provide students with the knowledge and skills to choose and consume healthy foods and beverages.[27]

Proposed Homeschool Nutrition Curriculum

This project consists of 16 lessons organized into weekly modules containing educational videos, handouts, hands-on activities, weekly recipes, and worksheets to test their knowledge. The introductory lesson is about kitchen safety to educate the students on potential kitchen hazards to prevent injury and illness in this course. The students will watch demonstration videos on basic knife skills and complete a worksheet on proper food temperatures. Module 2 is about The USDA MyPlate, which demonstrates and explains the importance of consuming nutrient-dense foods and beverages. Students will review the components of MyPlate and identify at least three examples from each category in their homes. Module 3, protein, educates the students on different sources, the importance of protein, and how much is needed for their age. Module 4 explores dietary fats, explains different sources of fat, and how to increase the consumption of unsaturated fats and limit saturated fats. Modules 5 and 6 focus on carbohydrates. Module 5 reviews simple carbohydrates and added sugar. Students will be introduced to the relationship between increased added sugar consumption and T2DM, CVD, and obesity. Module 6 explains the sources and benefits of complex carbohydrates such as fiber. Students will explore how to incorporate more complex carbohydrates into their diet. Module 7 explores the differences between portion and serving sizes that will prepare them for module 8, how to read a nutrition label.

Module 9 discusses food packaging claims, including a field trip so students can become informed consumers. This lesson encourages critical thinking to identify nutrition claims on

packages. Module 10 focuses on sodium; students will identify sources of sodium, understand the recommended dietary intake, explain the relationship with HTN, CVD, and stroke, and methods to reduce their sodium intake. Module 11 is a field trip for students to apply what they have learned about label reading and packaging claims. The students will use critical thinking skills from the course and choose healthier options. This lesson will also teach students how to grocery shop effectively by planning meals, creating a list, and sticking to a budget. In module 12, probiotics, students will identify foods that are rich in probiotics and define the difference between pre-and probiotics. Students will also explain why probiotics are important in the diet. Physical activity is module 13, where students will learn the benefits of being active and the recommended amount of physical activity. Students will explore different ways to increase activity by trying a new activity or doing more of something they enjoy. Module 14, fad diets, discusses diet trends and potentially harmful effects or pitfalls of following the latest trend. Module 15 emphasizes the importance of eating in moderation. The final module, 16, encompasses everything students have learned through this curriculum by emphasizing mindful eating. The students will learn the importance of not restricting their favorite foods while they improve their dietary intake of fruits, vegetables, lean meats, and whole grains.

Conclusion

The proposed nutrition curriculum in the homeschool setting allows for the adolescent child to learn through hands-on activities with foods they consume daily. The curriculum is designed for the student to identify gaps in their diet and offers an opportunity to correct them. A multi-component approach involving dietary modification and advocacy for a healthy lifestyle, such as regular physical activity, minimizing screen time, and behavioral interventions, have been found beneficial in preventing obesity.[28] Immediate consequences of being overweight and obese

during adolescence include poor body image and self-esteem, and long-term consequences include risk factors of weight-related diseases as an adult.[1] Improving eating habits and physical activity during the transitional stage of adolescence can positively impact schools and surrounding communities.[29]

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