

Relationship between Nutritional Status, Menstrual Health and Anemia among Adolescent Girls

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Abstract: Adolescence is a critical period of growth and development during which adequate nutrition and good menstrual health are essential for maintaining physical, cognitive, and reproductive well-being. Adolescent girls experience increased nutritional requirements because of rapid growth, hormonal changes, and the onset of menstruation. Inadequate dietary intake, poor nutritional status, menstrual blood loss, and limited awareness of menstrual hygiene can collectively increase the risk of iron deficiency and anemia.

This review examines the relationship between nutritional status, menstrual health, and anemia among adolescent girls. Nutritional status is influenced by dietary diversity, intake of iron and other micronutrients, body mass index, socioeconomic conditions, and food-related practices. Menstrual characteristics such as age at menarche, cycle regularity, duration, and menstrual blood loss may influence iron requirements and contribute to anemia. The review indicates that girls with inadequate iron intake, poor dietary diversity, undernutrition, or heavy menstrual bleeding are particularly vulnerable to anemia.

Keywords: Adolescent girls, nutritional status, menstrual health, anemia, iron deficiency, menstruation, dietary intake, menstrual hygiene.

I. INTRODUCTION

Adolescence represents a transition between childhood and adulthood and is characterized by rapid physical, physiological, psychological, and social development. For girls, this period includes substantial increases in body size, blood volume, muscle mass, and reproductive development. These changes increase nutritional requirements, particularly for iron, folate, protein, calcium, and other micronutrients. The onset of menstruation further increases iron requirements because regular blood loss can gradually reduce body iron stores. When dietary iron intake is insufficient to compensate for these losses, iron deficiency may develop and eventually progress to iron-deficiency anemia. The relationship between nutrition and anemia is therefore particularly important among adolescent girls. At the same time, menstrual health is affected by nutritional status, body composition, hormonal development, stress, and general health. Undernutrition can be associated with delayed or irregular menstruation, while nutritional deficiencies may worsen fatigue and other symptoms experienced during menstruation. Conversely, heavy or prolonged menstrual bleeding can increase iron loss and contribute to anemia. Thus, nutritional status, menstrual health, and anemia should not be considered as isolated health conditions but as interconnected components of adolescent health.

II. NUTRITIONAL STATUS AMONG ADOLESCENT GIRLS

Adequate nutrition during adolescence is essential for achieving optimal growth and maintaining reproductive health. However, adolescent girls may experience inadequate dietary intake because of poverty, food insecurity, dietary restrictions, limited nutritional knowledge, unhealthy eating patterns, or sociocultural practices. Iron deficiency is especially important because iron requirements increase considerably during adolescence and menstruation. Diets

dominated by refined cereals and low consumption of pulses, green leafy vegetables, fruits, nuts, seeds, eggs, and animal-source foods may provide insufficient bioavailable iron. In addition, consumption of tea or coffee close to meals can reduce iron absorption, while vitamin-C-rich foods can enhance absorption of non-heme iron. Nutritional assessment should therefore consider dietary diversity, meal frequency, anthropometric indicators, micronutrient intake, and socioeconomic circumstances. Both undernutrition and overweight can coexist with micronutrient deficiencies, meaning that body weight alone cannot adequately describe nutritional health. Improving dietary quality among adolescent girls requires attention not only to the quantity of food but also to the nutritional value and bioavailability of essential nutrients.

III. MENSTRUAL HEALTH AND ITS IMPORTANCE

Menstrual health is an important component of adolescent girls' overall health. Normal menstruation requires coordinated hormonal, reproductive, and metabolic functioning. The menstrual cycle can be influenced by nutritional status, stress, physical activity, body composition, illness, and endocrine factors. Menstrual health includes regularity of cycles, duration and amount of bleeding, absence of severe pain or other disabling symptoms, access to appropriate menstrual products, and the ability to manage menstruation safely and with dignity. Poor menstrual knowledge and inadequate menstrual hygiene facilities can create additional challenges, particularly in schools. Girls who experience heavy menstrual bleeding may lose greater amounts of iron each month and consequently face an increased risk of iron deficiency. Menstrual problems can also interfere with school participation, concentration, physical activity, and social engagement. Consequently, assessment of adolescent health should include questions about menstrual characteristics rather than focusing only on dietary intake and hemoglobin levels.

IV. RELATIONSHIP BETWEEN NUTRITIONAL STATUS AND ANEMIA

Nutritional status is one of the major determinants of anemia among adolescent girls. Iron is required for hemoglobin synthesis and oxygen transport, and insufficient iron intake can result in depletion of iron stores. Other nutrients, including folate, vitamin B12, vitamin A, protein, and vitamin C, also contribute to normal hematological function. A diet lacking these nutrients can increase the risk of nutritional anemia. Adolescents from economically disadvantaged households may be particularly vulnerable because limited household resources can reduce access to nutrient-rich foods. Cultural food restrictions may further limit dietary choices for girls. Poor nutrition can also influence immunity, physical capacity, cognitive performance, and resistance to infection. Therefore, anemia prevention should include a broader nutritional strategy rather than focusing exclusively on iron supplementation. Dietary counselling, nutrition education, improved food diversity, supplementation programs, and screening can work together to reduce anemia risk.

V. RELATIONSHIP BETWEEN MENSTRUAL HEALTH AND ANEMIA

Menstruation creates a direct physiological pathway through which adolescent girls can lose iron. Under normal circumstances, dietary iron and stored iron help compensate for menstrual blood loss. However, girls experiencing heavy, prolonged, or frequent menstrual bleeding may lose more iron than can be replaced through ordinary dietary intake. Repeated menstrual blood loss can therefore contribute to declining iron stores and eventually anemia. The risk may be greater among girls who already have poor dietary intake or low baseline iron stores. Symptoms such as tiredness, weakness, dizziness, headaches, reduced concentration, and shortness of breath may occur with anemia and can overlap with symptoms commonly attributed to menstruation. This overlap may cause anemia to remain unrecognized. Menstrual-health assessment should therefore be incorporated into anemia screening and adolescent health programs, especially when girls report unusually heavy bleeding, persistent fatigue, or recurrent menstrual difficulties.

VI. INTERRELATIONSHIP AMONG NUTRITION, MENSTRUATION AND ANEMIA

The relationship among nutritional status, menstrual health, and anemia can be understood as a continuing cycle. Poor dietary intake may reduce iron stores before menstruation begins. Once menstruation starts, regular blood loss increases iron requirements. If the diet does not provide sufficient absorbable iron, iron stores may progressively decline. If menstrual bleeding is heavy or prolonged, this process can occur more rapidly. Developing anemia may then cause fatigue, weakness, reduced physical capacity, and poor concentration, which can negatively influence educational participation and quality of life. Poor nutritional status may also affect menstrual regularity and reproductive development. Thus, the three factors influence each other through biological and social pathways.

Factor	Major Characteristics	Possible Relationship with Anemia	Potential Health Consequences
Nutritional status	Dietary diversity, BMI, iron intake, micronutrient intake	Low iron and micronutrient intake can reduce hemoglobin and iron stores	Poor growth, fatigue, impaired immunity
Menstrual health	Age at menarche, cycle regularity, duration, bleeding intensity	Heavy/prolonged bleeding can increase iron loss	Iron depletion, weakness, menstrual discomfort
Iron intake	Heme and non-heme iron consumption	Inadequate intake increases iron-deficiency risk	Reduced hemoglobin synthesis
Dietary diversity	Pulses, vegetables, fruits, eggs, meat, nuts and seeds	Limited diversity may increase micronutrient deficiencies	Undernutrition and poor health
Menstrual hygiene	Access to sanitary products, water and sanitation, knowledge	Poor hygiene may indirectly affect health and school participation	Discomfort, infections, absenteeism
Socioeconomic status	Household income, food security, parental education	Limited resources can restrict nutritious food access	Higher nutritional vulnerability
Anemia	Low hemoglobin and/or depleted iron stores	May result from nutritional deficiency and menstrual blood loss	Fatigue, poor concentration, reduced performance
Health education	Knowledge of nutrition and menstruation	Better awareness may support prevention and early treatment	Improved self-care and health-seeking behavior

VII. SOCIOECONOMIC AND CULTURAL INFLUENCES

Socioeconomic and cultural factors significantly shape the nutritional and menstrual experiences of adolescent girls. Household income, parental education, food availability, access to healthcare, and geographic location can influence dietary quality and access to anemia screening and treatment. In some communities, girls may receive less nutritious food than other household members because of gender-based food allocation practices. Menstruation may also be surrounded by misconceptions, stigma, and restrictions that discourage girls from discussing menstrual problems or seeking medical care. Limited access to sanitary products, private toilets, clean water, and appropriate disposal facilities can further complicate menstrual management. These factors demonstrate that anemia prevention requires more than individual behavior change. Family-level education, school-based interventions, accessible health services, and community awareness are necessary to address the social determinants associated with adolescent nutritional and menstrual health.

VIII. ROLE OF SCHOOLS AND HEALTH SERVICES

Schools provide an important setting for promoting adolescent nutrition and menstrual health because they can reach large numbers of girls during a critical developmental period. School-based programs may include nutrition education,

menstrual-health education, anemia screening, iron and folic-acid supplementation, counselling, and referral services. Teachers and school health personnel can help identify girls who experience persistent fatigue, poor concentration, menstrual difficulties, or other warning signs. Schools can also improve menstrual hygiene by ensuring access to clean water, functional toilets, privacy, and appropriate menstrual products. Health professionals can contribute through regular hemoglobin assessment, dietary counselling, identification of heavy menstrual bleeding, and referral for medical evaluation when required. Combining educational and health interventions is likely to be more effective than treating anemia alone.

IX. PREVENTION AND MANAGEMENT STRATEGIES

Prevention of anemia among adolescent girls requires an integrated approach. Regular consumption of iron-rich foods such as pulses, legumes, green leafy vegetables, fortified foods, eggs, meat, and other appropriate sources can improve iron intake. Vitamin-C-rich foods can be consumed alongside plant-based iron sources to enhance absorption. Iron-folic-acid supplementation may be required according to public-health recommendations, particularly in populations with a high prevalence of anemia. Regular screening can help identify anemia before severe symptoms develop. Girls reporting heavy or prolonged menstrual bleeding should receive appropriate assessment rather than relying solely on dietary advice. Menstrual-health education should address normal menstrual patterns, warning signs, hygiene practices, nutrition during menstruation, and when professional care should be sought. Family participation is also important because parents and caregivers influence food availability, healthcare utilization, and attitudes toward menstruation. Although considerable research has examined anemia and adolescent nutrition, further studies are needed to understand the combined relationship between nutritional status and menstrual health. Many studies focus primarily on hemoglobin concentration without comprehensively assessing dietary intake, menstrual blood loss, menstrual hygiene, socioeconomic conditions, and other determinants. Longitudinal research could provide stronger evidence regarding whether poor nutritional status precedes anemia or whether menstrual abnormalities and anemia develop simultaneously. Future studies should also consider dietary diversity, iron bioavailability, menstrual characteristics, body composition, physical activity, socioeconomic status, and access to health services. Research examining school-based interventions that simultaneously address nutrition and menstrual health would be particularly valuable.

X. CONCLUSION

The relationship between nutritional status, menstrual health, and anemia among adolescent girls is complex and multidimensional. Adolescence increases nutritional requirements, while menstruation introduces recurring iron losses that may place girls at greater risk of iron deficiency. Inadequate dietary intake, low dietary diversity, socioeconomic disadvantage, poor menstrual-health knowledge, and heavy menstrual bleeding can collectively increase anemia risk. Anemia, in turn, may negatively affect physical capacity, concentration, educational participation, and quality of life. The evidence supports an integrated adolescent-health approach that combines nutritious diets, iron and folic-acid supplementation where appropriate, menstrual-health education, menstrual hygiene facilities, regular screening, and timely clinical management of menstrual abnormalities. Addressing nutrition and menstrual health together can contribute substantially to reducing anemia and improving the overall health, educational participation, and well-being of adolescent girls.

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