

Research Article

Prevalence of Anemia and Undernutrition of Adolescent Females in Selected Schools in Ghana

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Anemia among adolescent females is a major worldwide public health problem which should be given appropriate attention. Half of all anemic cases are caused by iron deficiency. In addition to anemia, poor nutrition is also a challenge in sub-Saharan Africa. This study determined the prevalence of anemia and undernutrition among adolescent females in school. A cross-sectional study was conducted among 151 adolescent females in four basic schools in the Ahafo region of Ghana. The hemoglobin level and anthropometry measures of participants were taken to determine their anemic and nutritional status. The prevalence of anemia among adolescent females in school was 50.3%. Out of the 151 participants, 6.6%, 19.9%, and 23.8% were severely anemic, moderately anemic, or mildly anemic, respectively. Only 2% of the participants were underweight, but the rate of stunting was 26.5%. The notable high prevalence of anemia that was found among adolescent females was correlated with other health and wellness concerns. Anemia and under nutrition negatively affect academic performance, productivity, and general wellbeing of adolescents; therefore, effective measures should be put in place to correct and eradicate these nutritional problems.

1. Introduction

Adolescence is a transition period between childhood and adulthood [1]. During adolescence, there are periods of rapid mental, physical, psychological, and cognitive development [1]. Optimum cognitive development enhances school performances, problem solving abilities, and productivity of adolescents [1]. These developmental changes influence the nutritional needs of adolescents [1]. Nutritional status is defined as an individual's health condition as it is influenced by the intake and utilization of nutrients [2]. Nutritional status can be determined through anthropometric measurement of the body composition, biochemical measurement of serum protein, micronutrients and metabolic parameters, and assessment of altered nutritional requirement and social issues that may affect adequate nutrient intake [2]. Suboptimal nutritional status including excess and inadequate caloric intake and micronutrient deficiencies

could directly affect physical, psychological, and physiological functioning of the body [2]. Nutritional status can therefore be used as a determinant of growth, health, risk of chronic diseases, and long-term quality of life [1]. Adequate nutrition in adolescents serves as an investment into their adult health [3]. It also prevents the vicious cycle of malnutrition, chronic diseases, and poverty [3].

Worldwide, nutrient deficiencies are considered a dominant cause of anemia, and in sub-Saharan Africa, it is the major cause of anemia in adolescent females [4]. Ghana is among the countries with the highest burden of under nutrition, iron deficiency anemia, low serum retinol, and stunting [5]. Ghana was ranked 135 out of 187 countries with highest burden of malnutrition in the world [6].

The prevalence of nutritional anemia is estimated to be 40% worldwide [7]. Nutritional anemia may be defined as a low hemoglobin concentration due to deficiencies in hemopoietic nutrients such as iron, folate, and vitamin B₁₂ [8].

Deficiencies in hematinic nutrients are not only the most common causes of anemia but also are the easiest to treat once the specific deficient nutrient is determined [9]. Inadequate consumption of hemopoietic nutrients such as iron, vitamin B₁₂, and folate is a major cause of low hemoglobin concentration in the blood [8]. Low bioavailability of iron and other hematinic nutrients could be a contributory factor to anemia [9].

In preventing anemia, dietary adequacy and diversity are critical. However, most adolescents do not consider the nutritional composition of their meals but rather think about satisfying their hunger [10]. The increase rate of nutritional problems such as anemia and being overweight or obese in adolescents could be associated with high intake of energy-dense foods with little or no essential micro-nutrients [11].

Unfortunately, anemia can be caused by other factors, which are not associated with dietary intake. These causes include worm infestation, malaria, chronic blood loss, gastrointestinal bleeding, cancers, vascular lesions, and ulcers [8].

Anemia has a negative effect on the overall growth, cognitive development, and academic performance of adolescents [12]. Anemia can also result in fatigue and low productivity, which have a negative impact on the economy. Anemic adolescents who get pregnant also have an increased risk of morbidity, mortality, and poor birth outcomes such as low birth weight, premature birth, and still birth [12].

The health of adolescents has not been a major concern, and consequently, there has been limited research in the area of adolescent nutrition particularly in developing countries, hence the reason for this study. This study was conducted to determine the prevalence of stunting, underweight, and anemia among adolescent females in school in Ghana. The prevalence of anemia in this study was 50.3% which is an indication that anemia is still a public health problem in Ghana. The findings will therefore be relevant in the development of effective interventions to reduce anemia in Ghana.

2. Materials and Methods

2.1. Study Design and Setting. A cross-sectional study was conducted among adolescent females aged 10–19 years. Participants were recruited from four government-owned schools in the Tano North municipal district of the Ahafo region, Ghana.

2.2. Study Participants and Sample Size. Adolescent females attending upper primary and junior high schools were included in the study. A sample size of 260 was determined using Cochran's formula [13]. Out of about 280 female adolescents in the four basic schools, parents of 151 participants consented for their wards to participate in the study. A written assent was obtained from all the participants before data collection, since they were all below 18 years.

2.3. Data Collection. A structured questionnaire was used to obtain information from participants. Data collected include sociodemographics, anthropometry (weight, height, and body mass index), and biochemical data (hemoglobin level).

2.4. Anthropometric Measurements. Weight was measured with the Omron scale (Omron BF511) to the nearest 0.1 kilogram. The height of the participants was measured with a Seca stadiometer to the nearest 0.1 centimeter. The body mass index (BMI) was determined using the weight and height of the participants by calculating the weight (kg)/height (m²). Participants were classified as being underweight, normal, overweight, or obese with the use of the WHO BMI for age chart. Stunting among the adolescent females was determined with the WHO height for age chart [14].

2.5. Hemoglobin. Hemoglobin (Hb) levels of all participants were determined using a portable hemoglobin meter URIT 12 manufactured by Medical Electronic Group Company Limited in China. A drop of the capillary blood was obtained from the middle finger after a prick and was placed onto the hemoglobin meter strip. Based on the WHO classification, Hb levels below 8 g/dL were classified as severe anemia, 8–10.99 g/dL as moderate anemia, and 11–11.9 g/dL as mildly anemic, and Hb of 12 g/dL and above was classified as normal [15].

2.6. Data Analysis. Statistical Package for Social Sciences (SPSS) version 26.0 was used to determine the frequency distribution of participants who were anemic, stunted, underweight, and obese. Nutritional status of participants was determined with the WHO's recommended age-specific cutoff points of BMI and height. Tables and figures were used to summarize the results obtained. Continuous variables with normal distribution were expressed as mean ± SD (standard deviation), while proportions were calculated for discontinuous ones.

3. Results

The participants were classified into early, middle, and late adolescents based on their ages. The ages ranged from 10 to 17 years. The majority of the participants were in early adolescence. Majority of the mothers (61.4%) and fathers (44.6%) of the participants were traders and farmers, respectively. Also, 19.3% of mothers and 14.5% of fathers of participants had no formal education. Table 1 presents the above characteristics of the participants.

To determine the mean hemoglobin level of participants, the prevalence of anemia and anemia classification among the adolescent females is displayed in Table 2, and descriptive statistics was performed. More than half (50.3%) of the adolescent females were anemic. Out of the 76 anemic participants, 47.4% were mildly anemic, 39.5% were moderately anemic, and 13.1% were severely anemic.

TABLE 1: Characteristics of participants.

Variable	Mean \pm SD N = 151
Age in years	12.87 \pm 1.89
Variable	Frequency (%)
Age distribution of participants	
Early adolescence (10–13 yrs)	106 (62.7)
Middle adolescence (14–16 yrs)	43 (34.9)
Late adolescence (17–19 yrs)	2 (2.4)
Education of mother	
No formal education	25 (19.3)
Basic (JHS)	65 (47)
Secondary (SHS)	48 (26.5)
Tertiary	13 (7.2)
Education of father	
No formal education	24 (14.5)
Basic (JHS)	38 (26.5)
Secondary (SHS)	59 (42.1)
Tertiary	30 (16.9)
Occupation of mother	
Trading	97 (61.4)
Farming	34 (25.3)
Others ¹	20 (13.3)
Occupation of father	
Trading	15 (13.3)
Farming	60 (44.6)
Driving	24 (19.3)
Teaching	10 (4.8)
Mason	8 (1.2)
Others ²	34 (16.8)

Others¹, teaching, hairdressing, cleaning, police officer, and cooks. Others², carpentry, barbering, teaching, trading, banking, pastor, and doctor. SD, standard deviation.

TABLE 2: Prevalence and classification of anemia among adolescent females.

Variable	Mean \pm SD N = 151
Hb levels	11.6 \pm 2.1
Prevalence of anemia (frequency %)	
Anemic	76 (50.3)
Not anemic	75 (49.7)
Anemia classification (frequency %)	
Severe anemia	10 (6.6)
Moderate anemia	30 (19.9)
Mild anemia	36 (23.8)

The anthropometric measures showed that majority (82.1%) of the participants had a normal body mass index (BMI). Two (1.3%) participants were classified as obese, and 2% was classified as underweight. Figure 1 shows the BMI classification of the participants. Table 3 presents the mean BMI and height for age of the participants. Stunting among the adolescent females was 26.5%.

Table 4 presents the prevalence of anemia and the presence of malaria. Majority (72.4%) of the anemic participants had normal BMI with few of them being obese (2.6%) and underweight (1.3%). About 60.5% of the anemic participants reported to have had malaria prior to the study. The prevalence of anemia and the presence of malaria are displayed in Table 5.

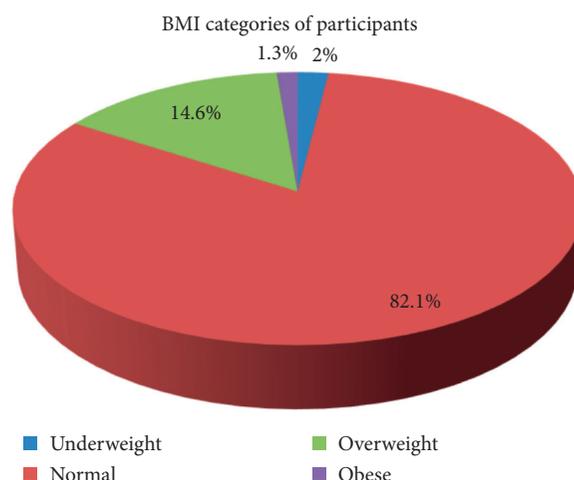


FIGURE 1: BMI classification of participants.

TABLE 3: Anthropometric measures of adolescent females.

Variable	Mean \pm SD N = 151
Weight (kg)	42.3 \pm 10.2
Height (cm)	148.6 \pm 14.1
BMI (kg/m ²)	18.7 \pm 2.9
Height for age (frequency %)	
Stunted	40 (26.5)
Not stunted	111 (73.5)

4. Discussion

The overall mean age of participants was 12.3 \pm 1.76 years which ranged from 10 to 17 years. Most of the participants (70.2%) were within the ages of 10–13 years (early adolescence) and few of them (1.3%) were in their late adolescence (17–19 years). This was similar to a study conducted among adolescent females in Bangladesh where most (50%) of the participants were in their early adolescence, 30.7% in middle adolescence, and 19.3% in late adolescence [16]. In this study, a majority of the participants were in their early adolescence which could be attributed to the typical demographics of most adolescents in Ghana upper primary and junior high schools.

The majority of participants had normal BMIs with few of them being underweight, overweight, and obese. A different study conducted in Bangladesh showed similar results where 80% of adolescent females had a normal BMI, with few of them being thin or severely thin and overweight [16]. Out of the 124 participants with normal BMI, 44.4% were anemic. The findings of the study showed that 81.8%, 50%, and 50% of the overweight, underweight, and stunted participants, respectively, were anemic. The two participants who were obese were also anemic. The findings of this study are indications that adolescent females could be anemic regardless the BMI class they belong. However, the results of the study showed that greater percentages of overweight and obese participants were anemic and that may not be a good reflection since the obese and overweight participants were few.

TABLE 4: Prevalence of anemia and BMI classification.

BMI classification	Anemic (frequency (%)) N = 76	Not anemic (frequency (%)) N = 75
Normal	55 (72.4)	69 (92)
Underweight	1 (1.3)	2 (2.7)
Overweight	18 (23.7)	4 (5.3)
Obese	2 (2.6)	0 (0)
Prevalence of anemia and stunting (frequency (%))		
Stunted	20 (26.3)	20 (26.7)
Not stunted	56 (73.7)	55 (73.3)

TABLE 5: Prevalence of anemia and the presence of malaria.

Variable	Anemic (frequency (%)) N = 76	Not anemic (frequency (%)) N = 75
Presence of malaria	46 (60.5)	29 (38.7)
No malaria	30 (39.5)	46 (61.3)

The prevalence of anemia among adolescent females in school was found to be 50.3% in this study. The high prevalence of anemia in this study is similar to a study conducted in India where 64.7% of adolescent females were found to be anemic [17]. The prevalence of anemia among female adolescents in this study is high compared to that of a study conducted in Ethiopia where the prevalence ranged from 9.3% to 34.8% in female adolescents [18]. The prevalence of anemia was also found to be 21.1% in school-going girls in western Kenya, and it is also lower compared to the findings of this study [4]. The differences in the anemia prevalence could be due to variation in the geographical area and study participants. In Ghana, the prevalence of anemia in women of reproductive age (15–49 years) was 42.4% in 2014 [19], and the increase in anemia prevalence in this study could be attributed to the age differences. In the present study, the prevalence of severe anemia was 6.6%, while moderate and mild anemia were 19.9% and 23.8%, respectively, and it is in line with a different study where the prevalence of severe, moderate, and mild anemia was 0.2%, 6.3%, and 33.0%, respectively [20].

The high prevalence of anemia in adolescence could be associated with the rapid growth of the adolescents experience during this period which increases their requirement for hematinic nutrients such as iron, folate, and vitamin B₁₂. A study conducted in Ghana showed that animal foods per calorie have a higher influence on hemoglobin levels [21]. However, a typical Ghanaian diet is chiefly carbohydrate with little animal protein.

The onset of menarche, loss of blood through menstruation, and malaria could also be contributory factors to the high prevalence of anemia in adolescent females [1]. Majority of the anemic participants (60.5%) reported to have been diagnosed and treated for malaria one month prior to the study, but since it was self-reported, it may not be a true reflection. Sensitive laboratory indicators such as serum ferritin, serum iron, and full blood count would have been very useful, but it was not performed as it would drive the cost of the study high.

In December 2018, the Ministry of Health together with the Ghana Education Service and other agencies started the first phase of the intermittent weekly girl iron folic acid tablet supplementation (GIFTS) program in Bono, Ahafo, Northern, upper east, and Volta regions of Ghana to address the high prevalence of anemia (26.4%) among adolescent girls of 15–19 years [22]. The evaluation of the GIFTS program revealed that majority of adolescent females missed taking the iron folic acid (IFA) tablets because the tablets were not received from their teachers. Some adolescent females also perceived the IFA tablet as either a contraceptive or fertility drug and therefore refused to take the tablets [23]. The findings of this study showed that the prevalence of anemia in adolescent females is still high in Ghana, even though there have been an intervention in the form of school-based IFA supplementation (60 mg elemental iron and 400 µg of folic acid), an intervention reported by other studies to be feasible and effective in preventing anemia [24].

5. Conclusion and Recommendations

The prevalence of anemia among adolescent females in school is still a public health problem in Ghana. Effective nutritional interventions in the form of food fortification and supplementation should be provided to prevent anemia and its effects on academic performance, productivity, and overall growth of adolescent females. The girl iron folic acid tablet supplementation programme should be made effective through sensitization, expanded training, and streamlined monitoring in all basic schools. Majority of the participants had normal BMI with few of them being underweight, overweight, or obese. Nutrition education in schools could help eradicate undernutrition and stunting among adolescent females.

Data Availability

The primary data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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