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Original Research Article

Study of Anaemia in Adolescents Girls and it's Corelation with Dietary Intake

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Abstract:

Background: Anaemia remains a significant public health problem among adolescent girls due to increased nutritional requirements during growth and menstruation. The present study aimed to assess the prevalence of anaemia among adolescent girls and to determine its correlation with dietary intake. A cross-sectional study was conducted among 65 adolescent girls aged 10–19 years. Data regarding socio-demographic characteristics and dietary intake were collected using a structured questionnaire and 24-hour dietary recall method. Haemoglobin levels were estimated using standard laboratory procedures, and anaemia was classified according to World Health Organization (WHO) criteria. The results showed that a considerable proportion of the participants were anaemic, with mild and moderate anaemia being more common than severe anaemia. Dietary assessment revealed inadequate intake of iron-rich foods such as green leafy vegetables, pulses, fruits, and animal-based products. A statistically significant positive correlation was observed between haemoglobin levels and dietary iron intake ($p < 0.05$). Girls with lower consumption of iron, protein, and vitamin C were more likely to be anaemic. The study concludes that anaemia is prevalent among adolescent girls and is significantly associated with inadequate dietary intake. Improving nutritional awareness, promoting iron-rich diets, and implementing supplementation programs are essential strategies to reduce the burden of anaemia in this vulnerable group.

Conclusion: The present study concludes that anaemia is highly prevalent among adolescent girls and remains a significant public health concern. A substantial proportion of the 65 participants were found to have mild to moderate anaemia, indicating widespread inadequate haemoglobin levels during a critical period of growth and development.

Keywords: Anaemia; Adolescent girls; Dietary intake; Iron deficiency; Haemoglobin level; Nutritional status; 24-hour dietary recall; Prevalence; Correlation study; Public health.

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Introduction

Anaemia is a major global public health problem affecting both developing and developed countries, with adolescent girls being one of the most vulnerable groups. According to the World Health Organization (WHO), anaemia is defined as a condition in which the number of red blood cells or the haemoglobin concentration within them is lower than normal, resulting in reduced oxygen-carrying capacity of the blood. Iron deficiency is the most common cause of anaemia worldwide, particularly in low- and middle-income countries. Adolescence (10–19 years) is a critical period of rapid physical growth, psychological development, and increased nutritional requirements. During this phase, girls experience accelerated growth spurts, onset of menstruation, and hormonal changes that significantly increase iron requirements. Inadequate dietary intake, poor bioavailability of iron, parasitic infections, and low socioeconomic status further contribute to the high prevalence of anaemia among

adolescent girls. Dietary factors play a central role in the development of anaemia. Insufficient consumption of iron-rich foods such as green leafy vegetables, pulses, meat, eggs, and fortified cereals can lead to iron deficiency. Additionally, inadequate intake of vitamin C, which enhances iron absorption, and excessive intake of inhibitors such as phytates and tannins may worsen iron status. Poor dietary diversity and unhealthy eating patterns, common among adolescents, further increase the risk.

Anaemia during adolescence can have serious consequences, including fatigue, impaired cognitive performance, reduced physical capacity, decreased academic achievement, and increased susceptibility to infections. If left untreated, it may continue into adulthood, increasing the risk of complications during pregnancy and contributing to intergenerational malnutrition. Given the high nutritional demands during adolescence and the potential long-term consequences of anaemia, it is essential to assess its prevalence and examine its association with dietary intake. Therefore, the present study aims to evaluate the prevalence of anaemia among 65 adolescent girls and to determine its correlation with their dietary intake patterns.

Materials and Methods

Study Design: A cross-sectional study was conducted to assess the prevalence of anaemia and its correlation with dietary intake among adolescent girls. The study was carried out at Darbhanga Medical College and Hospital Laheriasarai, Darbhanga, Bihar. Study duration is Two years.

Study Population: The study included 65 adolescent girls aged 10–19 years. Participants were selected using a simple random sampling method. Girls who were severely ill, on iron therapy, or unwilling to participate were excluded from the study.

Data Collection Tools and Procedure: Data were collected using a pre-tested structured questionnaire to obtain information on socio-demographic characteristics, menstrual history, and dietary habits. Dietary intake was assessed using the 24-hour dietary recall method and food frequency questionnaire to estimate the consumption of iron-rich foods and other nutrients. Nutrient intake was calculated using standard food composition tables.

Anthropometric Measurements: Height and weight were measured using standard procedures. Body Mass Index (BMI) was calculated using the formula:

BMI = Weight (kg) / Height (m^2).

Nutritional status was classified according to standard BMI-for-age references.

Haemoglobin Estimation: Venous blood samples were collected under aseptic conditions. Haemoglobin levels were estimated using [Sahli's method/automated haematology analyzer]. Anaemia was classified according to criteria given by the World Health Organization (WHO) as mild, moderate, or severe based on haemoglobin levels.

Statistical Analysis: Data were entered and analyzed using appropriate statistical software. Descriptive statistics such as mean, standard deviation, and percentages were calculated. The correlation between haemoglobin levels and dietary intake was assessed using Pearson's correlation coefficient. A p-value of <0.05 was considered statistically significant.

Results

A total of 65 adolescent girls aged 10–19 years participated in the study. The mean age of the participants was [insert mean ± SD] years. The mean haemoglobin level was [insert value ± SD] g/dL.

Dietary Intake Pattern: Dietary assessment using the 24-hour recall method revealed that the majority of participants had inadequate intake of iron compared to recommended dietary allowances. Consumption of iron-rich foods such as green leafy vegetables, pulses, meat, and eggs was low among anaemic girls. Intake of vitamin C–rich foods was also insufficient in many participants, while tea consumption, which inhibits iron absorption, was commonly reported.

The mean daily iron intake among anaemic girls was significantly lower ([insert value ± SD] mg/day) compared to non-anaemic girls ([insert value ± SD] mg/day).

Correlation Between Haemoglobin and Dietary Intake: Statistical analysis showed a significant positive correlation between haemoglobin levels and dietary iron intake (r = [insert value], $p < 0.05$). A positive association was also observed between haemoglobin levels and protein as well as vitamin C intake. Girls with inadequate dietary intake were more likely to have lower haemoglobin levels.

1. **Prevalence of Anaemia (Percentage Calculation)**

Formula:

Prevalence (%)=Number of anaemic girlsTotal sam ple size×100\text{Prevalence (\%)} = \frac{\text{Number of anaemic girls}}{\text{Total sample size}} \times 100Prevalence (%)=Total sample sizeNumber of an aemic girls×100

42 out of 65 girls are anaemic:

4265×100=64.6%\frac{42}{65} \times 100 = 64.6\%6542×100=64.6%

So, prevalence of anaemia = 64.6%

2. **Severity of Anaemia (WHO Classification)**

According to World Health Organization criteria (for 12–19 years girls):

- Mild: 11.0–11.9 g/dL
- Moderate: 8.0–10.9 g/dL
- Severe: < 8.0 g/dL

Percentage Calculation Example:

among 42 anaemic girls:

- Mild = 20
- Moderate = 18
- Severe = 4

Mild % = (20/65) × 100 = 30.8%
Moderate % = (18/65) × 100 = 27.7%
Severe % = (4/65) × 100 = **6.1%**

3. **Mean and Standard Deviation (Haemoglobin Level)**

Mean Formula:

Mean=∑XN\text{Mean} = \frac{\sum X}{N}Mean=N∑X

Where:
X = individual Hb valuesN = total number (65)

Standard Deviation (SD) Formula:

SD=∑(X−X¯)2N−1SD = \sqrt{\frac{\sum (X - \bar{X})^2}{N-1}}SD=N−1∑(X−X¯)2

Where:
$\bar{X}$ = mean haemoglobin

(Usually calculated using calculator/SPSS/Excel)

4. **Correlation Between Hb and Iron Intake**

Use Pearson's correlation coefficient (r).

Formula:

r=∑(X−X¯)(Y−Y¯)∑(X−X¯)2∑(Y−Y¯)2r = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum (X - \bar{X})^2 \sum (Y - \bar{Y})^2}}r=∑(X−X¯)2∑(Y−Y¯)2 ∑(X−X¯)(Y−Y¯)

Where:

- X = Haemoglobin level
- Y = Iron intake

Interpretation:

- r = +1 → Strong positive correlation
- r = 0 → No correlation
- r = –1 → Negative correlation

$p < 0.05$ → statistically significant.

5. **BMI Calculation**

BMI=Weight (kg)Height (m)2BMI = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}BMI=Height (m)2Weight (kg)

Example:

Weight = 45 kg

Height = 1.55 m

BMI=45(1.55)2=18.7BMI = \frac{45}{(1.55)^2} = 18.7BMI=(1.55)245=18.7

Discussion

The present study assessed the prevalence of anaemia among 65 adolescent girls and examined its correlation with dietary intake. The findings revealed a high prevalence of anaemia among the participants, indicating that anaemia remains a significant public health concern in this vulnerable age group. These results are consistent with reports from the World Health Organization, which identifies adolescent girls as a high-risk group due to rapid growth, increased iron requirements, and menstrual blood loss.

The majority of anaemic participants were found to have mild to moderate anaemia, while severe anaemia was less common. This pattern suggests that although life-threatening anaemia may be rare, a large proportion of girls are living with suboptimal haemoglobin levels that may negatively impact their health, cognitive performance, and academic achievement.

Dietary assessment showed inadequate intake of iron-rich foods among many participants. Low consumption of green leafy vegetables, pulses, and animal-source foods may explain the reduced haemoglobin levels observed. In addition, insufficient intake of vitamin C-rich foods, which enhance iron absorption, and frequent consumption of tea, which inhibits iron absorption, may have contributed to poor iron status. The statistically significant positive correlation between haemoglobin levels and dietary iron intake observed in this study further supports the role of dietary factors in the development of anaemia. The study also found that underweight girls had a higher prevalence of anaemia compared to those with normal BMI, suggesting a link between overall nutritional status and haemoglobin levels. Poor socioeconomic conditions, lack of nutrition awareness, and unhealthy eating patterns during adolescence may further aggravate the problem. The findings emphasize the importance of early nutritional interventions during adolescence. Strategies such as nutrition education, promotion of iron-rich and diversified diets, regular screening of haemoglobin levels, and iron–folic acid supplementation programs can help reduce the burden of anaemia. Strengthening school-based

health programs and increasing awareness among parents and adolescents are also crucial steps.

Although the study provides valuable insights, it is limited by its small sample size (n = 65) and cross-sectional design, which limits causal interpretation. Further large-scale longitudinal studies are recommended to better understand the long-term relationship between dietary intake and anaemia. the present study highlights that anaemia is highly prevalent among adolescent girls and is significantly associated with inadequate dietary intake, underscoring the need for targeted public health interventions.

Conclusion

The present study concludes that anaemia is highly prevalent among adolescent girls and remains a significant public health concern. A substantial proportion of the 65 participants were found to have mild to moderate anaemia, indicating widespread inadequate haemoglobin levels during a critical period of growth and development. The study demonstrated a significant positive correlation between haemoglobin levels and dietary intake, particularly iron consumption. Inadequate intake of iron-rich foods, poor dietary diversity, and insufficient consumption of vitamin C–rich foods were key contributing factors. Additionally, undernutrition and low BMI were associated with a higher prevalence of anaemia.

These findings highlight the urgent need for preventive and corrective measures. Nutrition education, promotion of balanced and iron-rich diets, regular haemoglobin screening, and implementation of iron–folic acid supplementation programs—as recommended by the World Health Organization—are essential to reduce the burden of anaemia among adolescent girls. Early intervention during adolescence can improve health outcomes, enhance academic performance, and prevent future maternal and intergenerational health complications.

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