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Iron Deficiency Anemia in Adolescent Girls: A Comparative Review of Prevalence in Iran and Global Contexts

Salimeh Azizi[1], *Maryam Soleimani houni[2], Fatemeh Shoaee[3], Sedigheh Shariatmoghani[4]

[1]MSN, Instructor, Department of Nursing, Shirvan Faculty of Nursing, North Khorasan University of Medical Sciences, Bojnurd, Iran. [2]Midwifery Group Instructor, School of Nursing and Midwifery, Jiroft University of Medical Sciences, Jiroft, Iran. [3]Gynecologist, Fellowship in Minimally Invasive Gynecologic Surgery, Kowsar Hospital, Department of Gynecology and Obstetrics, Shiraz University of Medical Sciences, Shiraz, Iran. [4]Faculty Members, Department of Health, Mashhad University of Medical Sciences, Mashhad, Iran.

Abstract

Background*:* Iron deficiency anemia (IDA) is a widespread public health concern, especially among adolescent girls, due to its adverse effects on growth, cognitive development, and academic performance. This study aims to review the prevalence of IDA among high school girls under 18 in Iran and compare it with global data.

Materials and Methods*:* A comprehensive review of Persian and English articles published up to January 2025 was conducted using databases including CIVILICA, PubMed, Scopus, Web of Science, and Google Scholar. The review focused on reviews, systematic reviews, and studies not previously included in systematic reviews. Two independent reviewers ensured rigorous article selection.

Results: Globally, IDA affects about 9–11% of adolescent girls, with the overall anemia prevalence near 15%. In India, the prevalence is alarmingly high, ranging from 65.7% to 77.3%, with many cases classified as moderate to severe. Contributing factors include poor dietary diversity, parasitic infections, socioeconomic constraints, increased iron requirements during adolescence and menstruation, and cultural practices. In Iran, the prevalence of anemia among adolescent girls varies widely-from 5.8% to 21.4%-with iron deficiency rates reaching up to 70.9% in certain regions. Systematic reviews report an IDA prevalence of about 10.6% among Iranian high school students and 13.9% among children and adolescents, with significant regional variability. Key contributing factors include rapid growth, menstruation-related blood loss, inadequate iron intake, parasitic infections, and socioeconomic challenges.

Conclusion: Despite lower national averages compared to high-burden countries like India, some Iranian provinces report alarmingly high IDA rates. These disparities highlight the urgent need for targeted, region-specific interventions addressing dietary, socioeconomic, and health infrastructure factors to effectively reduce IDA among adolescent girls in Iran and globally.

Key Words: Anemia, Adolescent, Iran, Iron Deficiency, Prevalence, Global.

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Corresponding Author:

Maryam Soleimani houni, Jiroft University of Medical Sciences, Jiroft, Iran.

Email: soleimanihouni.maryam55@gmail.com

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1- INTRODUCTION

Anemia, particularly iron deficiency anemia (IDA), remains one of the most prevalent nutritional disorders worldwide and poses a critical public health challenge, especially among adolescent girls (1, 2). Adolescence is characterized by rapid physical growth, increased nutritional demands, and the onset of menstruation, all of which significantly elevate the risk of iron deficiency and anemia in this population (3, 4). The consequences of anemia during adolescence are profound, potentially impairing cognitive and physical development, reducing academic performance, weakening immune function, and diminishing quality of life (2, 5).

Globally, anemia affects approximately 15% of adolescent girls, with iron deficiency anemia accounting for 9–11% of cases (2, 6). However, prevalence rates vary substantially across regions. In India, anemia prevalence among adolescent girls ranges from 65.7% to 77.3% in some reports, with many cases classified as moderate to severe (1, 7). These disparities reflect a complex interplay of dietary habits, socioeconomic status, health infrastructure, and cultural practices that influence anemia risk (8, 9).

In Iran, anemia prevalence among high school girls shows considerable regional variability, ranging from 5.8% to over 21.4%, with iron deficiency rates reaching as high as 70.9% in certain areas (10–12). Systematic reviews and meta-analyses confirm that IDA remains a persistent public health issue among Iranian children and adolescents (13, 14). Contributing factors include inadequate dietary iron intake, limited dietary diversity, low socioeconomic status, restricted access to healthcare, parasitic infections, and insufficient health education (5, 9, 12). Adolescents from disadvantaged backgrounds face a higher risk due to barriers in accessing nutritious foods and healthcare services (8, 15).

Given the significant health implications of IDA and the observed regional disparities, comprehensive, evidence-based research focusing on Iranian adolescent girls is essential. Understanding the prevalence, risk factors, and unique challenges faced by this population is vital for designing effective public health interventions and policies (10–12). Furthermore, comparing the Iranian context with global trends provides valuable insights into the determinants of anemia and informs the development of targeted strategies to reduce its burden both nationally and internationally (1, 2).

This study aims to comprehensively assess the prevalence and key risk factors of IDA among Iranian high school girls under 18 years of age and to compare these findings with global prevalence rates. By examining regional variability and underlying determinants within Iran alongside international data, this research seeks to contribute to the evidence base necessary for developing effective and targeted anemia prevention and control strategies (1, 2, 10–12).

2- MATERIALS AND METHODS

This study employed a narrative review approach to comprehensively evaluate the prevalence and risk factors of iron deficiency anemia (IDA) among Iranian adolescent girls, based on a synthesis of existing literature. The findings were then compared with global data.

2-1. Search Strategy

A comprehensive search was conducted across multiple electronic databases, including CIVILICA, PubMed, Scopus, Web of Science, and Google Scholar, covering all relevant publications up to January 2025. Both English and Persian language articles were included to ensure a

broad and inclusive collection of studies. The search strategy combined keywords and phrases such as “iron deficiency anemia,” “IDA,” “adolescent girls,” “prevalence,” “risk factors,” and “Iran,” using Boolean operators (AND, OR) to maximize retrieval of pertinent articles. Additionally, reference lists of selected articles were screened to identify further relevant studies.

2-2. Eligibility Criteria

Studies were considered eligible if they met the following criteria:

- Focused on Iranian adolescent girls aged 18 years or younger.
- Reported data on the prevalence of iron deficiency anemia or examined associated risk factors, including nutritional, socioeconomic, or health-related determinants.
- Were published as original research articles, reviews, or systematic reviews in English or Persian.
- Had not been included in prior systematic reviews or other reviews.

2-3. Exclusion Criteria

The following studies were excluded to maintain relevance and quality:

- Studies focusing on adult populations or non-Iranian groups.
- Articles that did not specifically address iron deficiency anemia or combined data with other anemia types without separate analysis.
- Interventional studies, randomized controlled trials, case reports, editorials, conference abstracts, and non-peer-reviewed articles.
- Studies lacking sufficient methodological detail or clear reporting of outcomes.

2-4. Data Extraction

Data were independently extracted by two reviewers using a standardized data extraction form. The following information was collected:

- Study details: author, year, study location, and design
- Participant characteristics: age range, gender
- Prevalence data: rates of anemia and iron deficiency anemia based on standard diagnostic criteria
- Risk factors: dietary patterns, socioeconomic status, menstrual history, parasitic infections, and other relevant variables.

2-5. Review Process

Two independent reviewers screened titles/abstracts and full texts for eligibility, resolving discrepancies by consensus. Findings were synthesized narratively, emphasizing Iran's prevalence rates, regional variations, and risk factors, with global comparisons for context.

2-6. Ethical considerations

This review was based solely on publicly available literature, so ethical approval was not required. Throughout the process, we strictly adhered to copyright laws and ensured accurate citation of all sources to avoid plagiarism. The review methodology was transparently documented to promote reproducibility and minimize bias. Additionally, only studies conducted with appropriate ethical oversight were included, thereby respecting the rights of original research participants.

3- RESULTS

Anemia among adolescent girls is a significant global health concern, with substantial regional variations. In India, prevalence rates are alarmingly high, ranging from 65.7% to 77.3%, with many

cases classified as moderate to severe (1, 7). In Iran, anemia prevalence among high school girls varies widely, from 5.8% to 21.4%, with iron deficiency rates reaching as high as 70.9% in certain areas, underscoring a critical public health issue (10–12). Globally, iron deficiency anemia (IDA) affects approximately 9–11% of adolescent girls, while the overall prevalence of anemia is estimated at around 15% (2, 6). The prevalence of anemia among high school girls in Iran and globally is summarized in **Tables 1–3**, highlighting regional variability and global comparisons.

3-1. Prevalence Rates

3-1-1. Regional Variability in Prevalence:

- Kermanshah: The prevalence of anemia is 21.4%, with 12.2% diagnosed with iron deficiency anemia (IDA) (10).
- Kavar: A lower prevalence was reported, with 5.8% for anemia and 1.7% for IDA (12).
- Mashhad: IDA affects 20.7% of adolescent girls, representing a significant public health concern (16).
- Babol: Anemia affects 33% of high school girls, of whom 15% suffer from IDA (17).
- Bandar Abbas: Anemia prevalence is reported at 20.5%, based on hemoglobin levels below 12 g/dL (18).
- Ilam: Prevalence ranges widely from 3.4% to 70.9%, with 28.5% classified as mild anemia and 45.2% showing signs of iron depletion (11).

3-1-2. Systematic Reviews of Iron Deficiency Anemia in Iran:

- A systematic review and meta-analysis (2017) included data from 27 studies conducted between 1990 and 2016, estimating the prevalence of IDA among Iranian children and adolescents under 18 years of age at 13.9% (95% CI: 10.8–17.1). The prevalence of iron deficiency was higher, at 26.9% (95% CI: 19.7–34.1). The analysis encompassed approximately 5,890 individuals from various regions (13).
- Another systematic review (2017) focused on high school students in Iran, reporting an overall IDA prevalence of 10.6% (95% CI: 9.7–11.5) based on nine studies conducted between 1996 and 2014, with a sample size of about 5,017 students (14).
- An overview (2024) that combined five systematic reviews and two additional reviews (159 studies in total) found that the overall prevalence of IDA and iron deficiency among Iranian children and adolescents was approximately 16.73% (range: 10.6–21.4%) and 24.18% (range: 17.95–27.7%), respectively (19).

3-1-3. Global Prevalence Rates:

- **India:** The prevalence of anemia among adolescent girls is extremely high, ranging from 65.7% to 77.33%, with many cases classified as moderate to severe (1, 7).
- **Worldwide:** Globally, iron deficiency anemia (IDA) affects approximately 9–11% of adolescent girls, making it a widespread condition in both developed and developing countries (2, 6).
- **WHO Estimates:** According to the World Health Organization (WHO), the global prevalence of anemia among adolescent girls is estimated at around 15%, underscoring its status as a major public health issue (20, 21).

Table-1: Regional differences in Anemia and Iron Deficiency Anemia Prevalence among Adolescent Girls in Iran.

Region (Publication year)	Anemia Prevalence (%)	IDA Prevalence (%)	Notes	References
Kermanshah (2008)	21.4	12.2	High prevalence among adolescent schoolgirls aged 14–20 years.	10
Kavar (2011)	5.8	1.7	Lower rates; majority had mild anemia.	12
Mashhad (2013)	Not reported	20.7	Significant public health concern due to high IDA prevalence.	16
Babol (2014)	33	15	High rates of anemia and IDA among high school girls.	17
Bandar Abbas (2016)	20.5	Not reported	Based on hemoglobin levels below 12 g/dL.	18
Ilam (2016)	3.4–70.9	Not reported	Wide-ranging prevalence; 28.5% mild anemia, 45.2% iron depletion.	11

IDA: Iron deficiency anemia.

Table-2: Systematic Review and Overview Findings on Anemia Prevalence in Iranian Populations.

Study Type, Publication year	Population	Anemia Prevalence (%)	IDA Prevalence (%)	Notes	Reference
Systematic Review (Children & Adolescents), 2017	Children & Adolescents (<18)	–	13.9	Meta-analysis of studies from 1990–2016; ID prevalence 26.9%.	13
Systematic Review (High School Students), 2017	High School Students	–	10.6	Based on studies conducted between 1996 and 2014.	14
Overview of IDA in Iran, 2024	Children & Adolescents (<18)	~16.73	~24.18	Review of five systematic reviews covering multiple regions.	19

IDA: Iron deficiency anemia.

Table-3: Global Prevalence of Anemia among Adolescent Girls.

Region/Year	Anemia Prevalence (%)	IDA Prevalence (%)	Notes	Reference
India (2023)	65.7–77.33	Not reported	Alarmingly high prevalence among adolescent girls.	1, 7
Worldwide (Global, 2024–2025)	~15	~9%–11	WHO estimates highlight anemia as a global issue among adolescent girls.	2, 6
WHO Estimates (2023)	~15	Not reported	Overall anemia prevalence among adolescent girls globally.	20

IDA: Iron deficiency anemia.

Anemia, particularly IDA, is a significant global health issue affecting adolescent girls, with substantial regional variability. In Iran, the prevalence of anemia among high school girls varies widely across regions and is influenced by factors such as socioeconomic status, dietary habits, and access to healthcare (19–22). Understanding these risk factors is essential for developing effective public health strategies to address this critical issue.

3-2. Global Risk Factors

3-2-1. Dietary Intake:

Insufficient iron intake is a common risk factor across studies, particularly in regions where dietary practices lack diversity and iron-rich foods are underconsumed (16, 18, 23). Poor dietary habits, such as skipping meals and

consuming low-quality cafeteria food, significantly contribute to IDA among adolescents (5, 6, 24). For instance, a study conducted in Kermanshah highlighted that inadequate dietary iron was a major contributor to anemia prevalence (10).

3-2-2. Socioeconomic Status:

Variations in anemia prevalence often correlate with socioeconomic factors. Lower parental education levels and reduced household income are strongly associated with higher rates of IDA (9, 10). Adolescents from families with limited financial resources often face challenges in accessing nutritious food, which exacerbates their risk of developing anemia (8, 15, 25).

3-2-3. Parasite Infestation:

Parasitic infections have been identified as significant contributors to anemia in certain regions of Iran. For example, a study in Kavar found that adolescent girls who experienced parasite infestation within the previous three months had a 6.83 times higher risk of developing anemia compared to those without such infections (12, 26).

3-2-4. Lifestyle and Health Awareness:

Sedentary lifestyles and low awareness of nutrition and anemia prevention further contribute to the prevalence of IDA among adolescents (9, 27). Schools that do not prioritize health education report higher rates of anemia among students. Conversely, regions with more robust health education initiatives tend to exhibit lower prevalence rates, likely due to improved nutritional practices and greater awareness (8, 28).

3-3. IDA Variability of Factors in Iranian Schoolgirls

The variability in the prevalence rates of iron deficiency anemia (IDA) among high school girls in different regions of Iran can be attributed to several interrelated factors:

3-3-1. Socioeconomic Conditions:

- Regions such as Kermanshah (21.4% anemia prevalence) and Bandar Abbas (20.5%) report higher rates, often due to limited access to healthcare and nutritious food (10, 18, 27). Lower socioeconomic status, including reduced parental education and income, is strongly associated with increased anemia prevalence (27, 29, 30).

3-3-2. Dietary Practices:

- Poor dietary habits, such as skipping meals or consuming low-quality food, are more common in areas with higher IDA rates (5, 8, 28, 31). Studies show that dietary diversity and adequate iron intake are crucial for anemia prevention, and regions with limited access to diverse diets tend to have higher prevalence rates (7, 32, 33).

3-3-3. Health Infrastructure:

- Regions with better healthcare access and public health interventions, such as Kavar (5.8%), report significantly lower prevalence rates compared to other areas (12, 26). Effective health education and awareness campaigns also contribute to reduced anemia rates by promoting healthier lifestyles and nutritional practices (17, 28).

3-3-4. Parasitic Infections:

- In some regions, parasitic infections are a significant risk factor for anemia. For example, adolescent girls in Kavar who experienced parasite infestation had a higher risk of developing anemia (12, 26). This underscores the importance of addressing parasitic infections as part of comprehensive public health strategies.

3-3-5. Cultural and Educational Factors:

- Cultural practices and educational levels influence dietary choices and health awareness. Regions with higher educational attainment and stronger

health education initiatives tend to have lower anemia prevalence due to improved nutritional practices and greater awareness (2, 10, 29, 30).

3-4. Contributing Factors to Iron Deficiency Anemia in Adolescent Girls Globally

Iron deficiency anemia (IDA) among adolescent girls worldwide is influenced by several key factors:

3-4-1. Nutritional Deficiency:

- Insufficient dietary iron intake is a primary cause, particularly among lower socioeconomic groups (20, 34, 35). Poor dietary practices, such as low consumption of iron-rich foods and reliance on plant-based diets with low iron bioavailability, further increase the risk of IDA (2). In developing countries, limited access to diverse diets significantly exacerbates the prevalence of IDA (2, 5, 20, 36).

3-4-2. Menstrual Blood Loss:

- The onset of menstruation leads to significant iron loss in adolescent girls, compounding their risk of anemia (3, 37). Women of reproductive age are especially vulnerable due to regular menstrual blood loss, which can result in chronic iron deficiency if dietary intake or supplementation is inadequate (2, 20, 38).

3-4-3. Increased Iron Demand during Adolescence:

- Rapid physical growth and the onset of menstruation during adolescence double the body's iron requirements, making adolescent girls more susceptible to IDA (20). This increased demand is driven by both the expansion of lean body mass and total blood volume (20).

- **3-4-4. Parasitic Infections:**

- Parasitic infections such as hookworm, malaria, and intestinal protozoa contribute to iron loss and impaired absorption, particularly in low-resource settings (2, 36, 39). For example, in India, 36% of adolescent girls were found to have intestinal parasitic infections, with a high concomitant prevalence of anemia (36, 39). These infections exacerbate iron depletion and increase the severity of anemia.

3-4-5. Socioeconomic Factors:

- Lower socioeconomic status is strongly correlated with higher IDA prevalence due to limited access to nutritious foods and healthcare services (2, 40, 41). Families with constrained resources often cannot afford iron-rich diets or supplements, further increasing the risk of nutritional deficiencies (10, 33).

3-4-6. Cultural and Educational Factors:

- Cultural practices and educational levels influence dietary choices and health awareness. Regions with higher educational attainment and more robust health education initiatives tend to have lower anemia prevalence, likely due to improved nutritional practices and greater awareness (2, 9, 42). Examples of Global Prevalence:

- **India:** Anemia among adolescent girls in India is a major public health concern, with prevalence estimates ranging from 21% to 96%, and a pooled rate of approximately 65.7% (7). National surveys report rates around 59%, with higher prevalence in rural, tribal, and low-income groups (43). Many cases are moderate to severe, driven by iron and vitamin B12 deficiencies, infections, poor diet, and limited healthcare access (1, 7). These findings highlight the urgent need for targeted, region-specific interventions to reduce anemia in this vulnerable population.

- **Indonesia:** A systematic review found an IDA prevalence of 21.1% among adolescent girls, with inadequate nutritional intake identified as a major contributing factor (6, 8).
- **Ethiopia:** High anemia prevalence among rural adolescent girls is linked to predominantly plant-based diets low in bioavailable iron (44).

4- DISCUSSION

Iron deficiency anemia (IDA) is a major global public health challenge, particularly among adolescent girls, due to their increased iron requirements during periods of rapid growth and the onset of menstruation. IDA adversely affects cognitive development, immune function, academic performance, and overall quality of life (6, 20). This discussion synthesizes evidence on the prevalence and risk factors of IDA among high school girls in Iran, compares these findings with global data, and explores their implications for public health interventions.

4-1. Prevalence of Anemia and Iron Deficiency Anemia in Iran

Iran exhibits considerable regional variability in the prevalence of anemia among adolescent girls, with rates ranging from as low as 5.8% to as high as 21.4% (10, 12). Iron deficiency rates can be even more pronounced, reaching up to 70.9% in certain provinces such as Ilam (11). These disparities highlight the multifactorial nature of anemia and the influence of regional socioeconomic, nutritional, and health factors. Key regional prevalence data include:

- Kermanshah: 21.4% anemia, 12.2% IDA (10)
- Kavar: 5.8% anemia, 1.7% IDA (12)
- Mashhad: 20.7% IDA (16)
- Babol: 33% anemia, 15% IDA (17)
- Bandar Abbas: 20.5% anemia (18).

Systematic reviews and meta-analyses confirm these findings, reporting an overall IDA prevalence of approximately 13.9% among Iranian children and adolescents (13) and around 10.6% among high school students specifically (14). A comprehensive 2024 overview synthesizing multiple studies estimated the national prevalence of IDA at 16.73% and iron deficiency at 24.18% (19).

The wide range in prevalence underscores the need for region-specific public health strategies. Factors such as parasitic infections, nutritional deficiencies, socioeconomic status, and genetic conditions like thalassemia contribute to this variability (28). For example, provinces like Hormozgan exhibit anemia prevalence as high as 37.4%, partly due to a higher incidence of beta-thalassemia, while Kurdistan reports much lower rates (28). Addressing anemia in Iran requires integrated approaches including nutritional education, iron supplementation, parasite control, and genetic counseling. The progress made through national thalassemia prevention programs demonstrates the potential impact of targeted interventions (28, 29).

4-2. Global Prevalence and Comparison

Globally, anemia affects approximately 15% of adolescent girls, with IDA accounting for 9–11% of cases (6, 20). However, prevalence rates vary significantly by region (**Table 4**):

India: Anemia prevalence among adolescent girls is extremely high, ranging from 65.7% to 77.33%, with many cases classified as moderate to severe (1, 7).

Worldwide: The average prevalence of anemia is about 15%, with IDA affecting 9–11% of adolescent girls (20).

In comparison, Iran’s national average prevalence of anemia among adolescent girls is generally lower than that of India but may exceed the global average in certain provinces, highlighting considerable internal disparities.

Table-4: Prevalence of Anemia and Iron Deficiency Anemia (IDA) Among Adolescent Girls: Global, Indian, and Iranian Data.

Region/Country	Anemia Prevalence (%)	IDA Prevalence (%)	Notes	Reference
Global	~15	9–11	WHO estimates	2, 6, 20
India	65.7–77.3	Not specified	Very high prevalence	1, 7
Iran (national average)	5.8–21.4	10.6–16.7	Wide regional variability	14, 19
Iran (high prevalence areas)	Up to 70.9	Up to 45.2	Certain provinces (e.g., Ilam)	11

4-3. Key Risk Factors in Iran and Globally

- **Dietary Intake:** Insufficient consumption of iron-rich foods (such as meat, legumes, and green leafy vegetables) and poor dietary diversity are major contributors to IDA in Iran and worldwide (5, 10, 18, 24, 27, 33). Insufficient iron intake is a primary risk factor in both global and Iranian contexts, especially where diets lack diversity and iron-rich foods are underconsumed. Poor dietary practices, such as skipping meals and consuming low-quality cafeteria foods, further increase the risk of IDA among adolescents (5, 10, 18, 24, 27, 32, 33).
- **Socioeconomic Status:** Lower parental education and household income are strongly correlated with higher anemia prevalence due to limited access to nutritious foods and healthcare (9, 10, 27, 33). Adolescents from low-income families are particularly vulnerable, as they often face greater challenges in obtaining adequate nutrition (9, 10, 15, 27, 28, 33).
- **Parasitic Infections:** Parasitic infections, such as helminths, exacerbate iron loss and increase the risk of anemia, especially in rural and underserved regions of Iran. For example, in Kavar, adolescent girls with recent parasitic infections were 6.83 times more likely to have anemia (12, 26).
- **Menstrual Factors:** The onset of menstruation and heavy or irregular menstrual bleeding increase iron requirements and the risk of deficiency. This is particularly relevant for adolescent girls in Iran, though it is not always directly measured in studies (10, 32, 33).
- **Health Education and Access:** Limited access to healthcare services and a lack of awareness about iron-rich diets and supplementation are key barriers to prevention and treatment, especially in remote or low-resource settings (6, 8, 28, 32).

4-4. Implications for Public Health

Addressing iron deficiency anemia (IDA) among adolescent girls in Iran requires multifaceted public health strategies tailored to regional needs and risk factors identified in the literature. The following interventions are supported by evidence from both Iranian studies and global research:

- **Targeted Nutritional Interventions:** Promoting iron-rich diets and supplementation programs is crucial, especially in high-prevalence regions such as Ilam, Kermanshah, and Babol, where iron deficiency rates can exceed 20% to over 70% (10, 17, 19). Nutritional education focusing on

increasing the consumption of iron-rich foods (e.g., meat, legumes, green leafy vegetables) and addressing meal-skipping behaviors has been shown to reduce anemia prevalence (5, 18, 24, 32, 45). Supplementation programs, particularly with iron and folic acid, have proven effective in school-based settings globally and should be expanded in Iran (6, 20, 46-48).

- **School-Based Screening and Supplementation:** Improving access to nutritious foods for low-income families is essential, as socioeconomic status strongly correlates with anemia risk (10, 19, 27, 29). Social policies that enhance food security and subsidize iron-rich foods can help mitigate disparities. Studies emphasize that adolescents from disadvantaged backgrounds face greater barriers to adequate nutrition and healthcare (15, 18, 48).
- **Socioeconomic Support:** Improving access to nutritious foods for low-income families is essential, as socioeconomic status strongly correlates with anemia risk (10, 19, 27, 29). Social policies that enhance food security and subsidize iron-rich foods can help mitigate disparities. Studies emphasize that adolescents from disadvantaged backgrounds face greater barriers to adequate nutrition and healthcare (15, 18, 48).
- **Parasitic Infection Control**: Integrating deworming and infection control into public health initiatives is vital, particularly in regions with high parasitic infection rates that contribute to anemia (12, 26, 49). Regular deworming campaigns combined with improved sanitation can reduce iron loss and improve anemia outcomes (20, 48, 49).
- **Health Education:** Increasing awareness about anemia prevention among adolescents, families, and communities enhances early recognition and promotes healthy behaviors (8, 28, 45). Educational interventions focusing on nutrition, menstrual health, and hygiene - including blended education packages and national school-based programs - have demonstrated positive impacts on knowledge, attitudes, practices, and iron status among Iranian adolescent girls (5, 13, 45, 50, 51).

5- CONCLUSION

Based on the results, anemia-particularly iron deficiency anemia (IDA)-among adolescent girls is a pervasive global health challenge with marked regional disparities. In Iran, prevalence rates vary significantly by region, ranging from as low as 3.4% to as high as 70.9%, reflecting differences in socioeconomic status, dietary habits, health infrastructure, parasitic infections, and educational awareness. Systematic reviews estimate the overall IDA prevalence among Iranian adolescents to be between approximately 10.6% and 16.7%, with iron deficiency rates even higher, indicating a substantial burden of nutritional anemia in this population.

Globally, anemia affects about 15% of adolescent girls, with IDA accounting for 9–11% of cases. In countries like India, prevalence is alarmingly high, ranging from 65.7% to over 77.3%, driven by factors such as poor dietary diversity, parasitic infections, socioeconomic challenges, and increased iron requirements during adolescence and menstruation. Cultural and educational influences also impact dietary habits and health awareness, contributing to these disparities.

The variability in anemia prevalence underscores the need for region-specific public health interventions focusing on improving nutritional intake, controlling parasitic infections, enhancing health

education, and addressing socioeconomic barriers. Targeted strategies that promote iron-rich diets, supplementation programs, and awareness campaigns are essential to reducing the burden of anemia among adolescent girls both in Iran and globally, thereby improving their health and developmental outcomes.

6- CONFLICT OF INTEREST: None.

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