Policy Brief

Anemia and its associated risk factors among young children, adolescent girls, and non-pregnant women of reproductive age in Lebanon:

Program and policy implications of the LIMA survey

ACRONYMS

GDP: Gross Domestic Product
LIMA: Lebanon Integrated Micronutrient, Anthropometry, and Child Development Survey 2023
MoPH: Ministry of Public Health
NPW: Non-Pregnant Women
PSC: Preschool Children
SMART: Standardized Monitoring and Assessment of Relief and Transitions
WASH: Water, Sanitation, and Hygiene
WHO: World Health Organization

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KEY POINTS

- This policy brief explores the prevalence of anemia and associated risk factors among children 6-59 months, adolescent girls aged 15-19 years and women of reproductive age using data from Lebanon's Integrated Micronutrient, Anthropometry and Child Development Survey (LIMA). LIMA is the first national survey in Lebanon that assessed nutritional and micronutrient status in vulnerable population groups.
- This policy brief is intended for policymakers and Government authorities. By providing evidence-based analysis and actionable recommendations, we aim to inform policy decisions and advocate for change. Ultimately, our goal is to inform and guide further actions to effectively address anemia in Lebanon.
- Anemia affects 17% of children, 20% of adolescent girls, 35% of non-pregnant women and 25% pregnant women.
- A higher risk of anemia is found in children with iron deficiency, vitamin A deficiency, stunting, inflammation, and in households that have inadequate sanitation.
- Among adolescent girls before menarche, anemia is significantly associated with iron deficiency and inflammation. After menarche, vitamin A deficiency emerges as a significant contributing factor alongside iron deficiency and inflammation.
- Iron deficiency in non-pregnant women is a primary determinant of anemia. Vitamin A deficiency and severe menstrual bleeding are also positively associated with anemia.
- About 11% of children, 5% of pre-menarche adolescent girls, 17% menarche adolescent girls and 24% of non-pregnant women suffer from iron deficiency anemia.
- The recent national survey identifies iron deficiency as a major risk factor for anemia across all population groups, individuals with iron deficiency have a 2-4 fold higher risk of developing anemia.
- While vitamin A deficiency is associated with a higher risk of anemia in most population groups, the deficiency prevalence is low, and thus, the proportion of anemia attributable to vitamin A deficiency is small.
- Pregnant women experience a sharp increase in anemia in the third trimester, with more than 42% of women in this group affected.

INTRODUCTION

Anemia is a global public health problem affecting over 1.9 billion people — about 25% of the world's population. It significantly impacts children, adolescents, and women, influencing their health, development, and quality of life. In children, anemia can impair growth, physical abilities, and cognitive development. In women it can lead to fatigue, reduced productivity, and complications during pregnancy. Untreated anemia can have severe and life-threatening consequences, varying by age, sex, and health status (1,2).

Defined as insufficient hemoglobin in the blood, anemia arises from diverse causes, including vitamin and mineral deficiencies, infectious diseases (e.g., malaria), systemic inflammation, and genetic disorders (3). While iron deficiency has long been considered a primary cause, its role varies by region and population (4). Data from 10 developing countries revealed that iron deficiency impairs physical and cognitive abilities and results in a median loss of 3.64 USD per capita, equivalent to 0.81% of GDP (5). Similar impacts were reported in many countries and at different scales (6). In addition, patients with anemia who suffer from various diseases such as rheumatoid arthritis, cancer, chronic kidney disease, congestive heart failure, and others have substantially increased healthcare costs compared to non-anemic patients (7,8). Reducing anemia is expected to yield health and economic benefits, especially in low and middle-income communities. An investment of 1 USD in interventions that aim at reducing anemia in women and children was estimated to generate 12 USD in economic benefit (9).

According to the World Health Organization's (WHO) latest global estimates, 40% of pre-school children 6-59 months of age and 30% of non-pregnant women 15-49 years of age are anemic (10). The WHO's results for the Central Asia, Middle East, and North Africa region were similar, with anemia estimated in 33% and 30% of pre-school children and non-pregnant women. In Lebanon, the 2021 SMART survey (11) found that 41% of Lebanon's pre-school children and 42% of non-pregnant women (15-49 years) were anemic. Importantly, Lebanon's 2021 SMART survey did not collect comprehensive data on anemia risk factors, highlighting the need for further research.

AIMS/OBJECTIVES

While previous studies in Lebanon have reported the anemia of different population groups, this policy brief presents the first thorough analysis of the risk factors of anemia in Lebanon. By identifying these risk factors, we aim to inform and guide further actions to effectively address anemia and improve the health and well-being of Lebanon's population.

METHODOLOGY

To thoroughly understand the etiology of anemia in Lebanon and address the knowledge gaps, national and international stakeholders conducted the "Lebanon integrated micronutrient, anthropometry and child development survey 2023 (LIMA)" (12). The LIMA is a national cross-sectional survey comprised of 10 strata: 8 geographical strata for each of Lebanon's governorates, one Syrian informal tented settlements stratum, and one Palestinian camps stratum. In selected households, the LIMA recruited children, adolescent girls, and women.

The LIMA used gold-standard methods[1] to measure the prevalence of anemia and its multiple risk factors. The definitions of anemia and all risk factors are described in detail in the LIMA report (12).

For this policy brief, multivariate analyses were conducted to identify risk factors significantly associated with anemia in various population groups: children 6-59 months of age, pre-menarche adolescent girls 10-19 years of age, menarche adolescent girls 10-19 years of age, and non-pregnant girls and women 15-49 years of age.

KEY FINDINGS

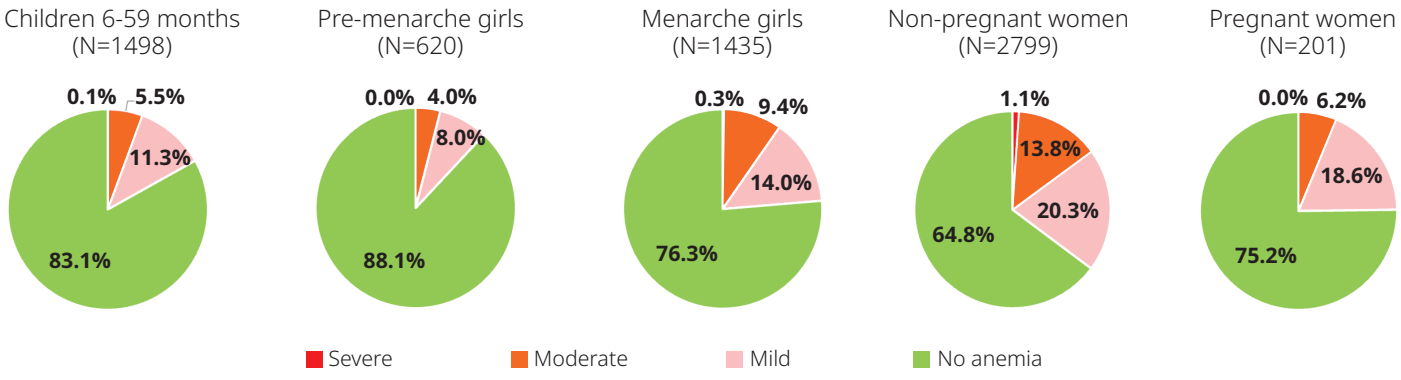
Anemia prevalence and severity in Lebanon

The LIMA found that approximately 17% of pre-school children, 12% of pre-menarche adolescent girls, 24% of menarche adolescent girls, 25% of pregnant women, and 35% of non-pregnant women are anemic (Figure 1). According to the WHO classification, this denotes a moderate public health problem in non-pregnant women and menarche adolescent girls and a mild problem in young children and pre-menarche girls (13).

Among all the population groups, few individuals have severe anemia. In all groups, mild anemia is the most prevalent form of anemia and moderate anemia accounts for about 30-40% of the cases (Figure 1).

The anemia prevalence in Lebanon shows significant variation across different target groups when compared to other countries. For children under 5 years old, the estimated global anemia prevalence was 40% in 2019. Children in Lebanon suffered less from anemia compared to many neighboring countries of the Eastern Mediterranean Region like Jordan (25%) (14), Oman (24%) (15), Egypt (33%), Kuwait (19%), and United Arab Emirates (20%) (16). However, the comparison of anemia prevalence among non-pregnant women reveals a more critical situation. In Lebanon, 35% of non-pregnant women aged 15 to 49 years are anemic, which is higher than the WHO's 2019 global estimation of 30% (16), but similar to the proportions in the eastern Mediterranean region (35%) (17) for the same age group. The percentage of women in Lebanon is higher than in Oman (28%) (15), Qatar (28%) and Morocco (30%) but close to those in Jordan (36%) (14) and Bahrain (35%)(17).

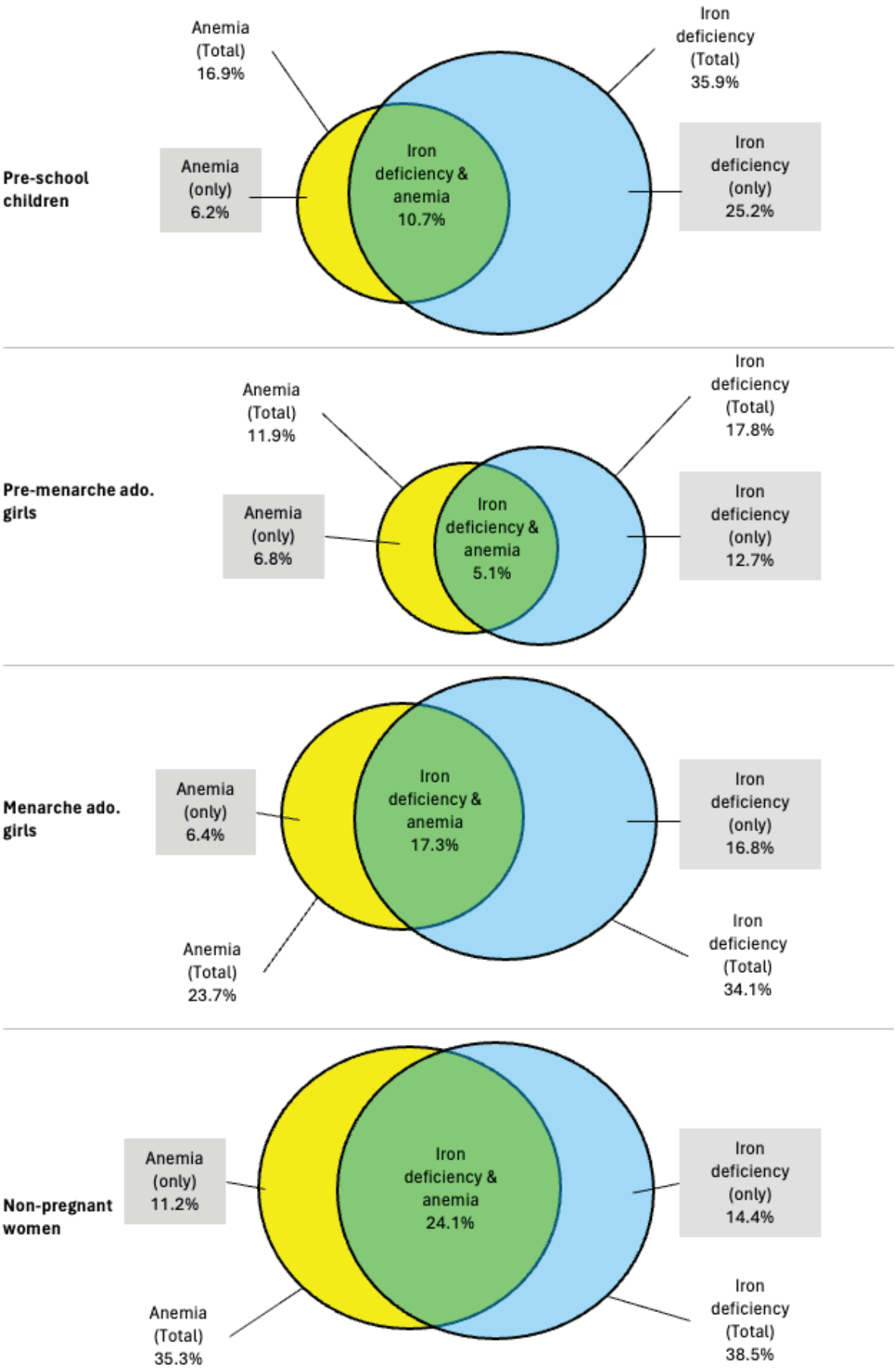
Figure 1. Anemia by severity among children 6-59 months, adolescent girls 10-19 years, non-pregnant women 15-49 years, and pregnant women



Factors associated with increased risk of anemia in Lebanon

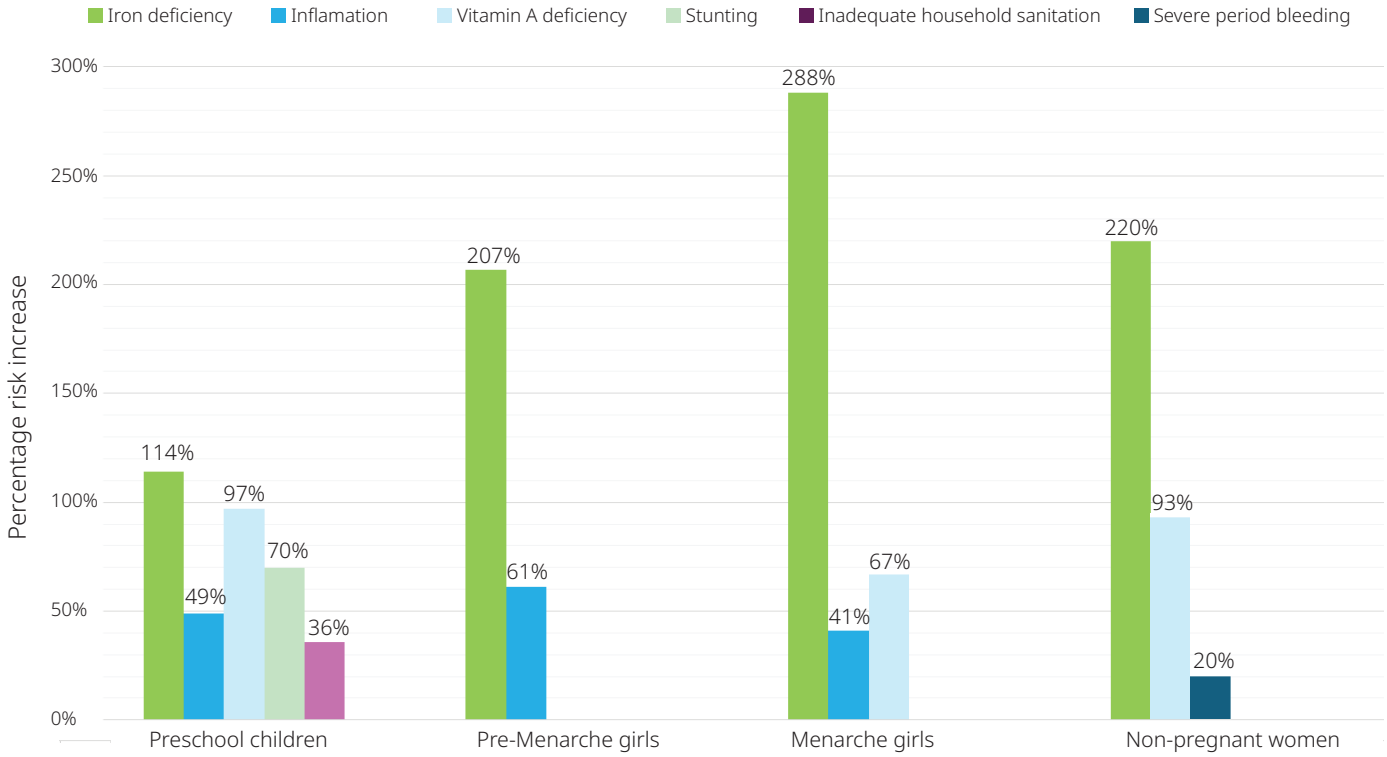
Iron deficiency anemia affects 10.7% of children, 5.1% of pre-menarche adolescent girls, 17.3% menarche adolescent girls, and 24.1% of non-pregnant women. Approximately 40-70% of anemic participants are iron deficient depending on the population group (Figure 2).

Figure 2. Overlap between anemia and iron deficiency



The multivariate analyses of the LIMA data shows that iron deficiency is associated with the highest risk of anemia in all population groups and has been identified as the main contributor to the overall anemia burden in Lebanon (Figure 3). Further, vitamin A deficiency considerably increases the risk for anemia, though the contribution to the overall anemia burden is small due to the low prevalence of vitamin A deficiency. In addition to nutritional factors, anemia of inflammation also contributes to the anemia burden in Lebanon, particularly in children and both pre-menarche and menarche adolescent girls. This highlights two primary areas to focus on in addressing anemia in Lebanon: improving nutrition (via diet, food fortification, supplementation) and reducing inflammation. Inadequate sanitation and severe bleeding were shown to be age-specific and also need to be addressed.

Figure 3. Factors associated with increased anemia risk by population group



Bivariate analyses were conducted for each factor. All factors with a significance of 0.1 were included in the model, but only variables with p-values of 0.05 were kept.

The prevalence of vitamin A deficiency in households with inadequate sanitation was low. Hence, the contribution of these factors to the overall anemia burden is small.
Risk factors for pregnant women were not assessed.

The multivariate analysis did not find an association between anemia and minimum dietary diversity[2], micronutrient supplement consumption, nor household food security[3]. Similarly, the multivariate analyzed found no association between anemia and folate, vitamin B12, vitamin D, or zinc deficiencies.

POLICY RECOMMENDATIONS

The LIMA identified two main groups of anemia risk factors: nutrition and inflammation.

Tackling anemia requires a multisectoral and intersectoral systems approach due to the diverse and complex risk factors contributing to the condition (18). Anemia is influenced by nutritional deficiencies, infections, chronic diseases, and socio-economic factors, necessitating coordinated efforts across various sectors. Health systems must focus on improving access to quality healthcare, including routine screening, treatment, and supplementation programs that provide essential micronutrients like iron and folic acid. The agriculture and food sectors play a crucial role in fortifying staple foods with key nutrients to address widespread deficiencies. In addition, the agriculture sector can enhance food security and promote the production of nutrient-rich foods. Education systems can raise awareness about optimal dietary practices and the importance of fortified foods and supplements, while social protection programs can address poverty-related issues that exacerbate anemia. Additionally, water, sanitation, and hygiene (WASH) interventions are crucial as they help prevent infections and parasitic diseases that can exacerbate anemia. By integrating and strengthening efforts across health, nutrition, education, agriculture, and social sectors, a comprehensive strategy can be developed to effectively prevent and manage anemia, ultimately improving population health outcomes.

To ensure the effectiveness and sustainability of anemia reduction interventions, establishing strong partnerships and securing both financial and political commitment from all partners and relevant stakeholders is essential. This commitment will help ensure that anemia reduction initiatives are prioritized and adequately resourced. Additionally, robust monitoring and evaluation frameworks must be established to track the progress of anemia reduction programs. This includes collecting and analyzing data to identify gaps and areas for improvement and engaging stakeholders in regular reviews and updates of intervention strategies.

ELEMENT 1. FOOD SYSTEMS

Element 1.1:
Plan and implement sustainable food fortification programs

The multivariate analysis presented above shows that nutritional anemia, particularly iron deficiency anemia, explains the majority of anemia cases. As such, policies should target this particular factor. In alignment with the Lebanese Ministry of Public Health (MoPH) National Nutrition Strategy and Action Plan (19), the fortification of wheat flour with iron and other micronutrients is an effective strategy to prevent and address anemia. As a first step, a feasibility assessment is necessary to identify stakeholders, establish fortification legislation and standards, estimate program costs, and set up monitoring and compliance procedures. Ensuring compliance by manufacturers and importers is crucial for effective implementation. Additionally, a coordination mechanism with appropriate governance is needed to ensure proper implementation and monitoring of agreed-upon procedures. It is important to note that while fortification of staple foods is a common approach, it may not effectively reach young children aged 6-23 months, whose caloric intake is limited compared to their micronutrient needs.

Element 1.2:

Promotion of nutritious diets to tackle anemia through economic nutrition

To address anemia effectively while maximizing economic efficiency, it is recommended that the Lebanese government adopts policies that integrate economic nutrition principles into dietary promotion. This could be done by making iron-rich foods such as lean meats, legumes, and fortified cereals more affordable, particularly for low-income families and at-risk population groups. It might also be considered to invest in agricultural programs that promote the cultivation of nutrient-dense crops and support smallholder farmers with training and resources to improve productivity and nutritional output, in line with nutrition-sensitive food system frameworks.

ELEMENT 2. HEALTH

Element 2.1:

Micronutrient supplementation is another viable approach to reduce nutritional anemia and one that circumvents the aforementioned limitation of food fortification for younger age groups.

Ensuring that children, adolescents, and pregnant and lactating women have access to affordable, safe, and nutritious food is fundamental for anemia prevention and control. However, for many, especially those residing in low- and middle-income countries (LMICs), poor-quality diets are the norm, and food intake is often insufficient to meet the unique and increased needs of these population groups. Consequently, the risk of micronutrient deficiencies is high.

In light of this, providing multiple micronutrient supplements (MMS) to pregnant and lactating women and multiple micronutrient powders (MNPs) to children aged 6-23 months is recommended to reduce the risks of potentially adverse effects on the mother and developing fetus, and to prevent nutritional anemia in early childhood.

To achieve high supplementation coverage, it is recommended to target children, adolescent girls, and women during their visits to Primary Healthcare Centers (PHCs), especially during prenatal and postnatal care visits. Supplements should also be distributed beyond PHCs to reach rural areas and informal tented settlements. Community-based distribution by health workers and midwives, as well as through schools or community platforms, has proven effective. As a preventive strategy, it is further recommended that all programs targeting children 6-23 months of age, or their caregivers should include MNPs. Given the low supplement consumption in Lebanon, supplementation programs must include promotional activities and behavior change communication to ensure compliance.

Furthermore, successful implementation of supplementation programs requires robust infrastructure and effective distribution and monitoring channels. Engaging the private sector and collaborating with medical associations can further increase awareness and support for supplementation efforts. This comprehensive approach will help improve the reach, impact, and sustainability of micronutrient supplementation programs, ultimately reducing nutritional anemia and enhancing overall public health.

Element 2.2:
Primary health care interventions to reduce anemia

Delayed cord clamping should be promoted in Lebanon, as it has been shown to improve hemoglobin levels and reduce the risk of anemia in newborns. Promoting delayed cord clamping on a national level will require the development of evidence-based guidelines, widespread healthcare provider training, and public health campaigns to raise awareness about its benefits. In addition, several primary health interventions can be implemented to reduce anemia of inflammation, Health education and awareness campaigns should aim to increase knowledge about the causes and prevention of anemia related to infectious diseases. This can be achieved by launching public health campaigns that explain the importance of hygiene and sanitation and their association with anemia. An important aspect of these campaigns should be educating communities about the causes of anemia and infectious diseases and how to prevent them.

Moreover, vaccination and disease prevention programs are necessary to reduce the incidence of infections that contribute to anemia. Key actions include expanding vaccination programs to prevent infectious diseases such as hepatitis B, measles, and influenza, in addition to implementing mass deworming programs to reduce the prevalence of helminth infections. Also, to reduce anemia of inflammation WASH programs must enhance access to clean water, invest in the development and maintenance of proper sanitation facilities, and promote appropriate hygiene practices.

Element 2.3:
Anemia routine screening

Anemia is often a silent condition. Screening for asymptomatic iron deficiency anemia can help with early identification and treatment before any symptoms appear. It forms an essential component of preventive healthcare, particularly in populations at higher risk, such as young children, adolescent girls, and women of reproductive age. A targeted screening is recommended to use blood hemoglobin as an indicator for anemia, along with a risk assessment instrument. This tool must include questions addressing iron-deficiency anemia risk factors like appetite, feeding/intake difficulties, poor growth (children), etc. The risk assessment must also consider any current acute infections or diseases that contraindicate the administration of iron supplements.

ELEMENT 3. EDUCATION SYSTEM

Element 3.1:
Nutrition education for school students

To reduce anemia among school-aged children and adolescents, it is recommended that the education system implement interventions to promote healthy diets and nutrition. Integrating nutrition education into school curricula ensures that children and their families learn to make healthy food choices. Schools should foster healthy food environments by providing access to nutritious foods, safe drinking water, and eliminating ultra-processed foods and sugar-sweetened beverages.

Element 3.2:
School supplementation programs

Boys and girls have similar iron needs from birth, but these requirements change during puberty when girls begin menstruating, leading to an increased risk of iron deficiency anemia. To address this issue, it is recommended that school-based iron and folic acid supplementation programs be implemented on a weekly basis for adolescent girls. These programs are particularly important in settings of household poverty and food insecurity, where dietary micronutrient intakes are insufficient to meet the increased demands. By integrating these interventions into the school environment, access barriers are solved, and adherence is secured, providing a sustainable solution to combat anemia in adolescent girls.

ENDNOTES

1. Hemoglobin concentration was measured on an automated complete blood count analyzer using venous blood samples. Anemia thresholds in WHO's 2024 guidelines (20) were used to classify individuals as anemic.

2. For women and adolescent girls, a minimum dietary diversity was calculated using the FANTA W-MDD method (21). Minimum diversity was defined for children 6-23 months of age using the 2021 updated WHO/UNICEF guideline on infant and young child feeding (IYCF) indicators for assessing IYCF practices (22). No international guidelines are set for older children; hence, the minimum dietary diversity was not calculated for this age group.

3. Household food insecurity: Household access to food in the past 30 days was assessed using the Household Food Insecurity Access Scale module according to guidelines developed by the Food and Nutrition Technical Assistance (FANTA) project (23). A score was obtained for categorizing households into a food insecurity access category.

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