

Effect of Date Fruit Consumption on Hemoglobin Levels in Anemic Adolescent Girls

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ABSTRACT

Anemia among adolescent girls remains a persistent public health problem, particularly in low- and middle-income countries, where increased nutritional requirements and menstrual blood loss elevate the risk of iron deficiency. Although iron supplementation is the primary preventive strategy, low adherence among adolescents necessitates complementary approaches. This study aimed to evaluate the effect of date fruit consumption on hemoglobin levels among anemic adolescent girls. A quantitative pre-experimental study with a one-group pretest-posttest design was conducted in a school setting in South Sulawesi, Indonesia. Hemoglobin screening was performed on 70 adolescent girls, and 10 anemic participants were selected using purposive sampling. The intervention consisted of consuming 100 g of date fruit (approximately 7–8 fruits) daily for seven consecutive days. Hemoglobin levels were measured before and after the intervention using a portable hemoglobin analyzer. Data were analyzed using descriptive statistics and the Wilcoxon Signed-Rank Test, with statistical significance set at $p < 0.05$. Mean hemoglobin levels increased significantly from 11.09 g/dL at baseline to 13.38 g/dL after the intervention, with an average increase of 2.29 g/dL ($p = 0.005$). These findings suggest that short-term date fruit consumption significantly improves hemoglobin levels among anemic adolescent girls. In conclusion, date fruit represents a feasible, culturally acceptable, food-based nutraceutical intervention that may complement existing anemia prevention programs. Further randomized controlled studies with larger samples and longer follow-up are recommended to confirm these findings and evaluate their long-term effectiveness.

Keywords

Adolescent Girls
Anemia
Date Fruit
Hemoglobin
Nutraceuticals

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Introduction

Anemia remains one of the most persistent and significant public health challenges worldwide, particularly among women of reproductive age and adolescent girls [1]. It is widely recognized as an indicator of poor nutritional status and is closely associated with impaired physical growth, reduced cognitive performance, decreased immunity, and long-term socioeconomic consequences [2]. Globally, anemia continues to affect millions of adolescents, especially in low- and middle-income countries, despite extensive international commitments to reduce its prevalence [3]. The World Health Organization has set a global target to reduce anemia among women of reproductive age by 50%. Yet, current trends indicate that this target is unlikely to be achieved in many regions [4].

Adolescent girls represent a particularly vulnerable group due to rapid physical growth, increased nutritional requirements, and regular menstrual blood loss [5]. During adolescence, iron demand rises sharply to support the expansion of blood volume, muscle mass, and overall growth [6]. When dietary intake fails to meet these physiological demands, iron deficiency anemia becomes highly prevalent [7]. In Indonesia and other developing countries, anemia among adolescent girls is strongly linked to inadequate dietary diversity, limited access to iron-rich foods, low socioeconomic status, and insufficient nutrition education [8]. These factors are often compounded by unhealthy lifestyle patterns, including irregular eating habits and poor sleep quality [9].

The consequences of anemia in adolescent girls extend beyond immediate health effects. Anemia reduces learning capacity, school performance, and productivity, thereby limiting human capital development [10]. In the long term, anemic adolescent girls are more likely to enter pregnancy with depleted iron stores, increasing the risk of maternal morbidity, adverse pregnancy outcomes, and intergenerational cycles of malnutrition [11]. Economic analyses have demonstrated that iron deficiency anemia contributes substantially to national productivity losses due to decreased cognitive potential and reduced work capacity, highlighting anemia as not only a health issue but also a development challenge [12].

National anemia prevention programs have primarily relied on pharmacological approaches, particularly iron and folic acid supplementation in the form of iron tablets [13]. While these interventions are evidence-based and practical, their real-world impact is often constrained by low adherence among adolescents [14]. Common barriers include limited

awareness of anemia, lack of perceived need, unpleasant taste, gastrointestinal side effects, and low motivation to consume supplements regularly [15]. As a result, anemia prevalence remains high despite widespread program implementation, underscoring the need for complementary, context-appropriate strategies [16].

Although iron supplementation is the cornerstone of anemia prevention, growing attention has been directed toward food-based and nutraceutical approaches as sustainable alternatives or complements to pharmacological therapy [17]. Nutraceuticals, defined as foods or food components that provide medical or health benefits beyond basic nutrition, offer a promising strategy for addressing micronutrient deficiencies in a culturally acceptable and behaviorally feasible manner [18]. However, empirical evidence supporting specific nutraceutical interventions for adolescent anemia remains limited, particularly in school-based and community settings.

Date fruit (*Phoenix dactylifera* L.) has long been recognized as a nutrient-dense food rich in carbohydrates, iron, vitamin C, vitamin B-complex, magnesium, zinc, and various bioactive compounds [19]. These nutrients play essential roles in erythropoiesis and hemoglobin synthesis. Vitamin C, in particular, enhances non-heme iron absorption, while iron directly contributes to hemoglobin formation [20]. Despite its nutritional potential and widespread cultural acceptance, especially in Muslim-majority communities, date fruit remains underutilised as a targeted intervention for anemia prevention in adolescents [20].

Previous studies have demonstrated that short-term consumption of date fruit is associated with significant increases in hemoglobin levels, suggesting its potential role in the management of anemia [21]. Nevertheless, the existing evidence is constrained by several methodological limitations, including small sample sizes, variability in intervention duration and dosage, and limited standardization of outcome measurements [22]. In addition, most studies have not specifically targeted adolescent girls, despite this group being at particularly high risk of iron deficiency anemia due to rapid growth and menstrual blood loss. Furthermore, date fruit has predominantly been examined as a general dietary component rather than being explicitly conceptualized and evaluated as a nutraceutical intervention with defined functional and therapeutic properties. These gaps highlight the need for more rigorously designed studies that position date fruit within a nutraceutical framework and focus on adolescent populations to strengthen the evidence base for food-based anemia prevention strategies.

In the Indonesian context, research on food-based interventions for anemia among adolescent girls remains relatively scarce. Most existing studies focus on pregnant women or young children, leaving a critical gap in evidence related to adolescents. Furthermore, school-based settings, which offer strategic access to large adolescent populations, remain underexplored as sites for nutraceutical interventions. There is also limited documentation on

short-term, practical interventions that can be easily integrated into school health programs without requiring complex logistics or high costs.

This study addresses these gaps by examining the effectiveness of date fruit nutraceuticals on hemoglobin levels in adolescent girls with anemia in a school setting. The novelty of this research lies in several key aspects. First, it positions date fruit explicitly as a nutraceutical intervention rather than merely a traditional food, highlighting its functional role in supporting hemoglobin synthesis and anemia prevention. Second, the study focuses on adolescent girls, a population that is biologically vulnerable yet often overlooked in intervention research, thereby contributing evidence to a critical but underrepresented area.

Third, the intervention protocol is simple, practical, and replicable: daily consumption of 100 grams (equivalent to 7–8 dates) over a short 7-day period. This approach reflects real-world feasibility and aligns with school-based health promotion efforts. Unlike long-term supplementation programs, which often face adherence challenges, using a palatable, culturally familiar food may enhance acceptance and compliance among adolescents.

Finally, this study contributes context-specific evidence from Indonesia, strengthening the local knowledge base for nutrition-sensitive anemia interventions. By demonstrating measurable improvements in hemoglobin levels following a brief nutraceutical intervention, the findings support integrating food-based strategies alongside existing iron supplementation programs. This research thus offers a novel, culturally appropriate, and sustainable perspective on anemia prevention among adolescent girls, with potential implications for school health policies and community nutrition programs.

Material and Methods

A. Study Design

This study employed a quantitative pre-experimental design using a one-group pretest–posttest approach. The design was selected to assess changes in hemoglobin (Hb) levels among adolescent girls before and after a nutraceutical intervention using date fruit. Baseline hemoglobin levels were measured before the intervention (pretest), followed by a post-intervention measurement after seven consecutive days of date fruit consumption. This design enabled a within-subject comparison to assess the intervention's effect on hemoglobin levels. This design was selected as a preliminary feasibility approach to evaluate the potential effect of date fruit consumption on hemoglobin levels among anemic adolescent girls in a real-world school setting. Given the limited availability of eligible participants and logistical constraints, a one-group pretest–posttest design was considered appropriate for generating initial evidence before conducting larger controlled studies. However, this design does not allow for definitive causal conclusions because changes in hemoglobin levels may also be influenced by external factors unrelated to the intervention.

B. Study Site and Population

The study was conducted at MTsN 1 Bone, located in Bone Regency, South Sulawesi, Indonesia. The study population consisted of all female students enrolled at the school during the study period. A total of 70 adolescent girls who met the general eligibility criteria and agreed to participate were initially screened for hemoglobin levels to identify anemia status.

C. Sampling Technique and Sample Size

A purposive sampling technique was applied to select participants for the intervention. The inclusion criteria were: (1) adolescent girls identified as anemic based on hemoglobin measurement, (2) willingness to consume date fruit during the intervention period, and (3) having an irregular or non-normal menstrual cycle based on self-reported information. Exclusion criteria included students who were not anemic, had chronic illnesses, or declined to participate in the intervention. Based on these criteria, 10 adolescent girls with anemia were selected as the final study sample and received the date fruit intervention. Before data collection, all participants received a clear explanation regarding the study objectives, procedures, potential benefits, and possible risks. Written informed consent was obtained from each participant. For participants under 18 years of age, consent was also obtained from parents or legal guardians. Participation was entirely voluntary, and participants were informed of their right to withdraw from the study at any time without any academic or personal consequences. A formal sample size calculation was not performed because this study was designed as a preliminary exploratory investigation. Among the 70 adolescent girls screened, only 10 met the eligibility criteria for anemia and agreed to participate in the intervention. Therefore, all eligible participants were included in the study. Although the sample size was limited, the within-subject pretest–posttest design allowed each participant to serve as her own control, enhancing the ability to detect changes in hemoglobin levels over time. Nevertheless, the small sample size may limit statistical precision and the broader applicability of the findings.

D. Data Collection Instruments

Data collection was conducted using a structured questionnaire and hemoglobin measurements to assess the effect of date fruit nutraceutical consumption on hemoglobin levels among adolescent girls. The questionnaire collected baseline information on participants' characteristics, menstrual cycle patterns, and willingness to consume date fruit during the intervention period. The nutraceutical intervention consisted of daily consumption of 100 grams of date fruit (equivalent to 7–8 dates) for seven consecutive days. All participants received the same intervention protocol, including the same type and amount of date fruit, to ensure consistency and standardisation. The research team supervised the intervention to ensure adherence.

Assessment of hemoglobin levels was performed using a portable hemoglobin-measuring device and conducted twice: before the intervention (pre-test) and after completion of the seven-day intervention (post-test). Hemoglobin measurements were performed by trained personnel following standard operating procedures to ensure the accuracy and reliability of the results.

The questionnaire used in this study had been previously validated. Responses were scored using a dichotomous scale, where 0 indicated an incorrect or negative response, and 1 indicated a correct or affirmative response. Reliability testing of the questionnaire was conducted before data collection. The reliability analysis demonstrated a Cronbach's Alpha value of 0.612, which met the acceptable reliability threshold (Cronbach's Alpha > 0.60). This value indicates moderate internal consistency, which is considered acceptable for exploratory and community-based health research instruments. The moderate reliability reflects the multidimensional nature of the questionnaire items, which address several aspects of dietary habits and menstrual characteristics among adolescent girls. The instrument's established validity and reliability ensured that the collected data were both accurate and consistent.

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0 and Microsoft Excel. Descriptive statistics were applied to summarize participant characteristics and hemoglobin levels before and after the intervention. Normality testing indicated that the hemoglobin data were not normally distributed; therefore, the Wilcoxon signed-rank test was used to analyze differences in hemoglobin levels before and after date fruit consumption. A p-value of < 0.05 was considered statistically significant. Although participants received a standardized date fruit intervention, potential confounding factors such as dietary iron intake, vitamin or iron supplementation, menstrual status during the intervention period, and recent acute illness were not systematically monitored or controlled. Therefore, the observed changes in hemoglobin levels may have been influenced by factors beyond the intervention itself.

E. Data Sources

This study employed primary and secondary data sources. Primary data were collected from adolescent girls at MTsN 1 Kabupaten Bone in 2025. They included hemoglobin level measurements conducted before and after the intervention using a portable hemoglobin testing device, along with basic demographic and menstruation-related information obtained through structured questionnaires. Secondary data were derived from peer-reviewed journals, national health reports, and international public health guidelines related to anemia in adolescent girls, iron deficiency, and nutraceutical interventions. These sources were used to contextualise the findings and support the public health relevance of the study. Ethical

approval documentation from the institutional ethics committee supported the conduct of this research.

F. Data Analysis

Data analysis was conducted to systematically evaluate the effect of date fruit nutraceutical consumption on hemoglobin levels among adolescent girls. All collected data were first reviewed for completeness and consistency to ensure data quality before analysis. Each respondent was assigned a unique identification code to maintain confidentiality throughout the analytical process. The cleaned data were then entered into a computerized statistical software program for further processing and analysis.

Descriptive statistical analysis was performed to summarize respondent characteristics and key study variables. Age distribution and anemia status among adolescent girls were presented using frequencies and percentages to describe the overall population profile. Hemoglobin levels before and after the intervention were summarised using measures of central tendency, particularly the mean, to illustrate changes following the intervention. The mean difference in hemoglobin levels was calculated to quantify the magnitude of the change attributable to date fruit consumption.

Before inferential analysis, the distribution of hemoglobin data was assessed to determine the appropriate statistical test. Given the small sample size and the paired nature of the pre-test and post-test measurements, the data did not meet the assumption of normality. Therefore, a non-parametric statistical approach was deemed most appropriate for hypothesis testing.

The effect of date fruit consumption on hemoglobin levels was analyzed using the Wilcoxon Signed-Rank Test. This test was selected to compare paired hemoglobin measurements before and after the 7-day intervention, in which participants consumed 100 grams of date fruit daily. The Wilcoxon test allowed for the evaluation of median differences in hemoglobin levels without requiring normally distributed data. Statistical significance was determined at a p-value threshold of less than 0.05.

The results of the Wilcoxon Signed-Rank Test showed a statistically significant increase in hemoglobin levels following the intervention ($p=0.005$). This finding indicates a meaningful difference between pre-intervention and post-intervention hemoglobin measurements. The average increase in hemoglobin levels further supports the effectiveness of date fruit nutraceuticals as a potential dietary intervention for improving anemia status among adolescent girls. All analytical procedures were conducted in accordance with ethical standards, and the interpretation of findings focused on both statistical significance and public health relevance, particularly in the context of anemia prevention among adolescent populations.

G. Ethical Approval

Ethical approval for this study was obtained from the Health Research Ethics Committee of STIKes Nani Hasanuddin, dated 31 May 2025, with ethical clearance number 5580/STIKES-NH/KEPK/V/2025. All research procedures were conducted in accordance with ethical principles for research involving human participants, including confidentiality, voluntary participation, and respect for participants' rights.

Results

This section presents the study's findings on the effectiveness of date fruit nutraceuticals in increasing hemoglobin levels among adolescent girls. The results are organized to describe respondents' characteristics, the prevalence of anemia, and changes in hemoglobin levels before and after the intervention. Data analysis focuses on comparing pre-intervention and post-intervention hemoglobin measurements following the consumption of 100 grams of dates daily for seven consecutive days. The statistical outcomes provide empirical evidence on the impact of date fruit intake on hemoglobin levels in anemic adolescent girls.

Table 1. Distribution of Respondents by Age (n = 70)

Age Group	Frequency (n)	Percentage (%)
Less than 14 years	65	92.9
More than 14 years	5	7.1

Most respondents were under 14 years old, indicating that hemoglobin screening predominantly involved early adolescent girls.

Table 2. Prevalence of Anemia Among Adolescent Girls (n = 70)

Hemoglobin Status	Frequency (n)	Percentage (%)
Anemia	10	14.3
Non-anemia	60	85.7

A total of 14.3% of adolescent girls were identified as having anemia and were subsequently included in the intervention phase.

Table 3. Changes in Hemoglobin Levels Before and After Date Fruit Intervention (n = 10)

Variable	Mean Hb (g/dL)	Minimum–Maximum (g/dL)	Mean Difference (g/dL)
Before intervention	11.09	10.3 – 11.8	–
After intervention	13.38	12.0 – 16.3	2.29
Change (Post-Pre)	–	–	+2.29

Statistical test: Wilcoxon Signed-Rank Test
p-value: 0.005

Based on the findings of this study, it can be provisionally concluded that consuming date fruit as a nutraceutical intervention has significant potential to increase hemoglobin levels among adolescent girls with anemia. Before the intervention, participants' hemoglobin levels

ranged from 10.3 to 11.8 g/dL, indicating mild to moderate anemia. This condition highlights the ongoing vulnerability of adolescent girls to anemia, which may adversely affect physical growth, cognitive performance, academic productivity, and long-term reproductive health if left unaddressed.

The mean hemoglobin level increased from 11.09 g/dL before the intervention to 13.38 g/dL after the intervention, representing an average increase of 2.29 g/dL. The post-intervention hemoglobin values also demonstrated a shift from the anemic range toward normal hemoglobin levels among most participants. The statistically significant Wilcoxon Signed-Rank Test result ($p = 0.005$) indicates a consistent pattern of improvement across participants following the intervention. Although measures of variability such as standard deviation, median, interquartile range, and effect size were not available for retrospective calculation, the magnitude of the observed mean increase suggests a potentially meaningful clinical improvement in hemoglobin status.

These findings suggest that date fruit, which is rich in iron, vitamin C, and other essential micronutrients, may support hemoglobin synthesis and erythropoiesis, thereby contributing to the correction of anemia in adolescent girls. Moreover, the use of date fruit as a food-based, non-pharmacological approach may offer practical advantages, including better acceptability, minimal side effects, and improved adherence compared with conventional iron supplementation. However, these conclusions should be interpreted with caution. The study employed a pre-experimental one-group pretest–posttest design without a control group and involved a relatively small sample size. Therefore, while the results are promising, further research using randomised controlled designs, larger samples, and more extended intervention periods is necessary to confirm the effectiveness of date fruit consumption and to explore potential confounding factors influencing hemoglobin levels in adolescent girls.

Discussion

This study provides empirical evidence that the consumption of date fruit as a nutraceutical intervention is associated with a significant increase in hemoglobin levels among adolescent girls with anemia. The findings demonstrate that a short-term dietary intervention, daily intake of 100 grams of date fruit for seven consecutive days, resulted in a meaningful improvement in hemoglobin concentration, with an average increase of 2.29 g/dL. This result is particularly relevant given that anemia remains a persistent public health problem among adolescent girls, especially in low- and middle-income settings where nutritional deficiencies and dietary inadequacies are common.

Before the intervention, participants' hemoglobin levels were predominantly within the mild-to-moderate anemia range. This condition reflects the physiological vulnerability of adolescent girls, who experience rapid growth, increased nutritional requirements, and

regular iron loss due to menstruation. Without appropriate intervention, anemia during adolescence can negatively affect physical development, cognitive function, academic performance, and future reproductive outcomes [23]. The observed baseline hemoglobin levels in this study are consistent with previous reports indicating that adolescent girls constitute a high-risk group for iron deficiency anemia [24].

Following the intervention, all participants showed an increase in hemoglobin levels, and most reached values within the normal range. The statistically significant result obtained from the Wilcoxon Signed-Rank Test ($p = 0.005$) suggests that the improvement was not due to chance. This finding supports the hypothesis that date fruit consumption positively affects hemoglobin synthesis. The magnitude of hemoglobin increase observed in this study is comparable to, and in some cases higher than, that reported in earlier studies examining food-based or complementary nutritional interventions for anemia among adolescents [25].

The beneficial effect of date fruit on hemoglobin levels may be explained through several interconnected biological mechanisms involving iron metabolism, erythropoiesis, and nutraceutical activity. Date fruit contains iron, an essential substrate for hemoglobin synthesis, as well as vitamin C, which enhances the intestinal absorption of non-heme iron by reducing ferric iron (Fe^{3+}) to the more bioavailable ferrous form (Fe^{2+}). Improved iron absorption increases iron availability for erythropoiesis within the bone marrow, thereby supporting red blood cell production and hemoglobin formation. Beyond its iron content, date fruit provides several micronutrients involved in hematopoiesis, including B-complex vitamins, magnesium, copper, and zinc. These nutrients serve as cofactors in enzymatic pathways required for erythrocyte maturation, DNA synthesis, and cellular metabolism. Adequate availability of these micronutrients may enhance the efficiency of erythropoietic processes and contribute to improved hematological status.

In addition, date fruit contains a wide range of bioactive compounds, including polyphenols, flavonoids, carotenoids, and natural antioxidants. Emerging evidence suggests that these compounds may reduce oxidative stress and inflammation, both of which can impair erythropoiesis and disrupt iron homeostasis. By attenuating oxidative damage and supporting cellular function, these bioactive components may create a physiological environment that favors effective red blood cell production. From a nutraceutical perspective, date fruit represents more than a simple dietary source of iron. Its combination of micronutrients and bioactive compounds may exert synergistic effects that enhance iron bioavailability, support hematopoietic function, and improve overall nutritional status. This integrated mechanism may partly explain the significant increase in hemoglobin levels observed in the present study and supports the potential role of date fruit as a complementary food-based intervention for anemia prevention and management among adolescent girls [26]. Date fruit contains iron,

which is a critical component of hemoglobin, as well as vitamin C, which enhances non-heme iron absorption in the gastrointestinal tract [27]. In addition, date fruit provides carbohydrates, B-complex vitamins, and minerals such as magnesium and zinc, which collectively support erythropoiesis and overall metabolic processes [28]. The synergistic action of these nutrients may contribute to the relatively rapid improvement in hemoglobin levels observed over the seven-day intervention period [29][30].

Another important aspect highlighted by this study is the acceptability of date fruit as an intervention among adolescent girls [31]. Unlike iron tablets, which are often associated with gastrointestinal side effects such as nausea, constipation, and abdominal discomfort, date fruit is generally well tolerated and culturally acceptable. This may lead to better adherence and sustainability if implemented as part of school-based or community-based nutrition programs [32]. The use of locally available, food-based interventions aligns with current public health recommendations that emphasize dietary diversification and sustainable nutrition strategies to address micronutrient deficiencies [33][34].

The biological plausibility of the present findings is supported by growing evidence from systematic reviews and clinical studies demonstrating the role of iron-rich foods and nutraceutical interventions in improving hematological outcomes. Contemporary research suggests that the combined effects of iron, vitamin C, polyphenols, and antioxidant compounds found in date fruit may enhance iron bioavailability, support erythropoiesis, and contribute to improved hemoglobin synthesis. These mechanisms are consistent with current evidence emphasizing the value of food-based approaches as complementary strategies for anemia prevention and management among adolescent populations. The findings of this study are also consistent with previous research demonstrating the effectiveness of date fruit or similar iron-rich foods in improving hemoglobin levels among adolescents and women of reproductive age. Several studies have reported significant increases in hemoglobin levels following regular consumption of dates, reinforcing the potential role of dates as a complementary approach to anemia prevention and management. The consistency of these findings strengthens the biological plausibility and practical relevance of using date fruit as a nutraceutical option.

Despite the promising findings, several limitations should be acknowledged. First, the study employed a one-group pretest–posttest design without a control group, limiting the ability to attribute the observed increase in hemoglobin levels exclusively to date fruit consumption. Other factors, such as variations in dietary intake, hydration status, menstrual patterns, and natural physiological changes, may have contributed to the observed outcomes. Second, the small sample size reduces the statistical power and generalizability of the findings. Therefore, the results should be interpreted as preliminary evidence rather than definitive proof of effectiveness. Future studies should employ randomized controlled trial designs with

larger sample sizes and longer follow-up periods to establish causality and confirm the sustainability of the intervention effects.

The findings of this study have several practical implications for anemia prevention among adolescent girls. For policymakers, date fruit may be considered as a complementary food-based strategy within existing adolescent nutrition and anemia prevention programs, particularly in areas where iron deficiency remains prevalent. Rather than replacing iron and folic acid supplementation, date fruit consumption could be integrated as a supportive nutritional approach that may improve program acceptability and dietary diversity. For schools, incorporating nutrition education on iron-rich foods and healthy dietary practices into school health activities may help increase awareness of anemia prevention. Schools may also collaborate with local health centers to conduct routine hemoglobin screening, nutrition counseling, and food-based health promotion activities targeting adolescent girls. The inclusion of nutrient-rich foods such as date fruit in school nutrition campaigns could provide a culturally acceptable and easily implemented strategy to encourage healthy eating behaviors.

For public health practitioners, the results highlight the potential value of community-based nutrition interventions that utilize locally available and culturally accepted foods. Health workers may incorporate education regarding iron-rich foods, including date fruit, into adolescent health services, reproductive health programs, and school-based health promotion initiatives. However, implementation should be accompanied by nutritional assessment, monitoring, and evidence-based guidance to ensure that food-based interventions complement established anemia prevention measures. Future implementation studies are needed to evaluate feasibility, cost-effectiveness, adherence, and long-term outcomes in routine practice settings.

Conclusion

This study found that daily consumption of 100 grams of date fruit for seven consecutive days was associated with an increase in hemoglobin levels among anemic adolescent girls. These findings provide preliminary evidence that date fruit may have potential as a complementary food-based approach for supporting anemia prevention and management in adolescents. However, given the pre-experimental design, absence of a control group, and small sample size, the results should be interpreted with caution and should not be considered conclusive evidence of effectiveness. Further research using randomized controlled trials, larger sample sizes, and longer follow-up periods is required to confirm these findings and establish the clinical and public health relevance of date fruit consumption for anemia management.

Conflict of Interest

The authors declare no conflict of interest.

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