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Changes in hemoglobin levels following seven-day Ajwa date consumption among adolescent girls with anemia

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Abstract

Background: Anemia is a common nutritional problem among adolescent girls and may affect physical growth, concentration, learning productivity, and future reproductive health. Ajwa dates contain iron and other nutrients and may be considered as a complementary food-based approach to support anemia management.

Purpose: This study aimed to analyze changes in hemoglobin (Hb) levels among adolescent girls with anemia after consuming Ajwa dates for seven consecutive days.

Method: This quantitative study used a pre-experimental one-group pretest-posttest design. Thirty-six adolescent girls aged 15–17 years with anemia were selected using purposive sampling. Each participant consumed 100 g of Ajwa dates daily after breakfast for seven consecutive days. Adherence to the intervention was monitored using a daily observation sheet. Hb levels were measured before the intervention and on day 8 using an Easy Touch GCHb device. Normality of the paired Hb differences was assessed using the Shapiro–Wilk test, followed by a paired t-test.

Results: All 36 participants completed the intervention and had recorded daily consumption. The mean Hb level increased from 10.231 ± 0.6274 g/dL before the intervention to 10.806 ± 0.6178 g/dL after the intervention. The mean increase was 0.5750 ± 0.3102 g/dL (95% CI 0.4700–0.6800). The paired t-test showed a statistically significant difference in Hb levels before and after the intervention ($t(35) = 11.122$, $p < 0.001$).

Conclusion: Hb levels increased significantly after seven days of Ajwa date consumption. However, because this study had no control group, the observed increase cannot be attributed solely to Ajwa date consumption. Ajwa dates may be considered a complementary food within standard anemia prevention and management programs.

Keywords: Anemia; Adolescent girls; Ajwa dates; complementary nutrition intervention; Hemoglobin.

INTRODUCTION

Anemia is an important nutritional problem among adolescent girls. Adolescence is characterized by rapid physical growth, which increases nutritional requirements, including iron. In adolescent girls, menstrual blood loss may further increase the risk of iron deficiency and anemia. The World Health Organization defines anemia according to hemoglobin concentration thresholds appropriate for age, sex, and physiological status. In non-pregnant adolescent girls, a hemoglobin concentration below 12 g/dL is generally used as the threshold for anemia (World Health Organization, 2024).

Anemia during adolescence may cause fatigue, reduced concentration, impaired learning productivity,

and decreased physical performance. If not appropriately managed, anemia may persist into the reproductive period and may contribute to health risks during future pregnancy. Prevention and management of anemia among adolescent girls include a balanced diet, adequate intake of iron-rich foods, adherence to iron and folic acid supplementation, and regular monitoring of hemoglobin levels (Ministry of Health of the Republic of Indonesia, 2018, 2020).

Dates are a potential source of several nutrients, including iron, energy, fiber, vitamins, and minerals. Previous studies have reported increased hemoglobin levels following consumption of dates or date-based

products among adolescent girls with anemia (Aisah et al., 2022; Lathifah & Utami, 2022; Umiyah et al., 2021). A study among school-aged girls with iron-deficiency anemia also reported improvements in hemoglobin, hematocrit, and ferritin following a date-based nutritional program (Irandegani et al., 2019).

However, previous studies have differed in date variety, intervention dose, duration, participant characteristics, and study design. The novelty of the present study lies in evaluating whole Ajwa dates at a dose of 100 g per day for seven consecutive days among adolescent girls with anemia in a school setting in Pesawaran Regency, Lampung, with daily monitoring of consumption and hemoglobin as the outcome. The intervention is positioned as a complementary food-based approach rather than a substitute for iron supplementation or medical treatment.

RESEARCH METHOD

This study employed a quantitative research approach using a pre-experimental one-group pretest-posttest design. Data collection was conducted in June 2026 at State Senior High School 1 Padang Cermin, Pesawaran Regency, Lampung. Hemoglobin (Hb) levels were measured before the intervention and on day 8 after the seven-day intervention. The target population consisted of 196 female students from grades X to XII. A total of 36 adolescent girls who met the eligibility criteria were selected using purposive sampling and completed the study procedures.

Anemia was defined as a hemoglobin concentration of <12.0 g/dL in non-pregnant females

aged 15–17 years. The inclusion criteria were adolescent girls aged 15–17 years who met the study hemoglobin criterion for anemia, were willing to participate, and resided within the working area of Hanura Public Health Center. The exclusion criteria were allergy to dates, underlying diseases that could affect hemoglobin levels such as thalassemia or leukemia, and absence during the intervention or measurement period.

The intervention consisted of consuming 100 g of whole Ajwa dates per day after breakfast for seven consecutive days. Adherence to date consumption was monitored using a daily observation sheet. Hb levels were measured from capillary blood samples using an Easy Touch GCHb device before the intervention and on day 8. The same measurement procedure was used for both pre- and post-intervention assessments according to the applicable standard operating procedure.

Univariate analysis was used to describe respondent characteristics and Hb levels using means, standard deviations, frequencies, and percentages. Normality was assessed using the Shapiro–Wilk test on the Hb difference score (post-intervention minus pre-intervention). Because the difference scores were normally distributed ($p = 0.116$), changes in Hb levels were analyzed using a paired t-test. The significance level was set at $\alpha = 0.05$. Data were analyzed using SPSS.

This study received ethical approval from the Health Research Ethics Committee of Universitas Malahayati (No. 5524/EC/KEP-UNMAL/VI/2026). All respondents provided written informed consent before participating in the study.

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RESEARCH RESULTS

Characteristics of Respondents (N=36)

Variable	Results
Age (Mean±SD) (Years) (Range)	16.00 ± 0.72 (15–17)
15	9/25.0
16	18/50.0
17	9/25.0
BMI (kg/m²) (n/%)	
15.5–20.1	22/61.1
21.9–31.9	14/38.9
Menstrual Cycle (Days) (n/%)	
21	2/5.6
24	6/16.7
25	4/11.1
26	2/5.6
28	4/11.1
30	6/16.7
32	10/27.8
34	2/5.6

Table 1 shows that the respondents had a mean age of 16.00 ± 0.72 years, with an age range of 15–17 years. Half of the respondents were aged 16 years (18; 50.0%), while 9 respondents (25.0%) were aged 15 years and 9 respondents (25.0%) were aged 17 years. Based on the recorded BMI intervals, 22 respondents (61.1%) had a BMI of 15.5–20.1 kg/m², while 14 respondents (38.9%) had a BMI of 21.9–31.9 kg/m². The mean menstrual cycle length was 28.28 ± 3.75 days, with a range of 21–34 days. The most common menstrual cycle was 32 days (10; 27.8%), followed by 24 and 30 days (each 6; 16.7%).

Table 2. Hemoglobin Levels Before and After Ajwa Date Consumption

Measurement Time	Mean (g/dL)	SD	Min	Max	Shapiro–Wilk p
Before intervention	10.231	0.6274	9.2	11.5	-
After intervention	10.806	0.6178	9.8	12.0	-
Difference (after – before)	0.575	0.3102	0.1	1.3	0.116

Table 2 shows that the mean hemoglobin level increased from 10.231 ± 0.6274 g/dL before the intervention to 10.806 ± 0.6178 g/dL after the intervention. The mean difference was 0.575 ± 0.3102 g/dL, with hemoglobin levels ranging from 9.2–11.5 g/dL before the intervention and 9.8–12.0 g/dL after the intervention. The Shapiro Wilk test for the difference showed $p = 0.116$ ($p > 0.05$), indicating that the difference in hemoglobin levels was normally distributed.

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Table 3. Difference in Hemoglobin Levels Before and After Ajwa Date Consumption

Comparison	Mean Difference (g/dL)	SD Difference	95% CI	t	df	p-value
After – Before	0.5750	0.3102	0.4700–0.6800	11.122	35	<0.001

Table 3 shows that the mean hemoglobin level increased by 0.5750 g/dL after the seven-day intervention, with a standard deviation of 0.3102 g/dL. The 95% confidence interval for the mean difference was 0.4700–0.6800 g/dL. The paired t-test showed a statistically significant difference in hemoglobin levels before and after the intervention ($t(35) = 11.122$; $p < 0.001$).

DISCUSSION

Adolescent girls have increased iron requirements due to growth and menstrual blood loss. However, these factors do not automatically explain the occurrence of anemia in every individual, because Hb levels may also be influenced by dietary iron intake, adherence to iron supplementation, nutritional status, infection, menstrual blood loss, and other health conditions. Therefore, respondent characteristics should be presented as context for the study population rather than as evidence of causal relationships.

The present findings are consistent with previous studies reporting increased Hb levels following consumption of dates or date-based products among adolescent girls with anemia. Studies have reported improvements following date consumption or date juice administration (Umiyah et al., 2021; Lathifah & Utami, 2022; Indira & Aisah, 2024). Studies using two-group designs have also reported increased Hb levels among participants consuming dates, including Ajwa dates (Handayani et al., 2024; Sari & Hariyanti, 2023). These findings support the potential role of dates as a complementary food-based intervention, although differences in populations, doses, intervention duration, and study designs should be considered.

Biologically, dietary iron contributes to hemoglobin synthesis, while other vitamins and minerals may support overall nutritional adequacy. Dates also provide energy and may represent a convenient food option for adolescents. However, the present study did not measure iron intake, ferritin, or other

biomarkers that could directly explain the mechanism underlying the observed Hb change. Therefore, the biological rationale should be interpreted as plausibility rather than direct evidence of mechanism.

The increase in Hb should also be interpreted in relation to intervention implementation. All respondents had recorded consumption of 100 g of dates daily, and administration after breakfast with daily monitoring resulted in consistent recorded exposure during the seven-day period. However, the adherence records documented date consumption and did not quantitatively assess adherence to iron supplementation, consumption of iron-rich foods, menstrual blood loss, or other interventions during the same period. Thus, the recorded adherence strengthens the consistency of intervention implementation but does not establish that Ajwa dates were the sole cause of the observed Hb increase.

The mean increase of 0.5750 g/dL was statistically significant, and the 95% confidence interval was entirely above zero. Nevertheless, statistical significance should not be interpreted as proof that anemia was corrected. The available results indicate an increase in Hb within the study group, while the absence of a control group limits causal interpretation. Further clinical assessment is needed for adolescents whose Hb remains below the anemia threshold.

The practical implication of this study is that Ajwa dates may be considered as a complementary food option in nutrition education for adolescent girls. Schools or school health units (UKS) may collaborate with public health centers to provide nutrition education, encourage adherence to iron supplementation, and monitor Hb screening results. Ajwa dates should not be positioned as a replacement for iron supplementation or medical treatment.

This study has several limitations. The absence of a control group limits the ability to establish causality. The relatively small sample size, recruitment from a single school, and purposive sampling limit generalizability. The intervention period was only seven days. During the observation period, iron (Fe)

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tablet use and adherence, dietary intake, menstrual blood loss, infection, and other factors that could influence Hb levels were not systematically recorded or quantitatively assessed; therefore, their possible contributions to the observed change cannot be ruled out. Daily observation sheets documented Ajwa date consumption but did not establish whether other dietary or supplementation practices remained unchanged. Hb was the only hematological parameter assessed; ferritin and other laboratory markers were not measured to confirm iron deficiency or evaluate iron stores. Future studies should consider a controlled or randomized design with a larger sample, a longer intervention period, systematic monitoring of dietary intake and Fe supplementation adherence, and assessment of ferritin and other relevant biomarkers.

CONCLUSION

Schools and school health units are recommended to collaborate with public health centers to strengthen anemia education, monitor adherence to iron supplementation, and follow up Hb screening results. Ajwa dates may be used as a complementary food in nutrition education but should not replace iron supplementation or medical treatment. Adolescents with persistent anemia should receive appropriate follow-up based on the underlying cause and severity of anemia. Future studies should include a control group, a larger sample size, a longer intervention period, monitoring of dietary iron intake and iron supplementation adherence, and assessment of ferritin or other relevant biomarkers.

SUGGESTION

Schools and school health units are recommended to collaborate with public health centers to strengthen anemia education, monitor adherence to iron supplementation, and follow up Hb screening results. Ajwa dates may be used as a complementary food in nutrition education but should not replace iron supplementation or medical treatment. Adolescents with persistent anemia should receive appropriate follow-up based on the underlying cause and severity of anemia. Future studies should include a control group, a larger sample size, a longer intervention period, monitoring of dietary iron intake

and iron supplementation adherence, and assessment of ferritin or other relevant biomarkers.

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