



The Effectiveness of Giving Orange Juice and Strawberry Juice on Increasing Hemoglobin Levels in Adolescent Girls with Anemia in Cihideung Village in 2025

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ABSTRACT

Anemia is still a major health problem among adolescent girls in Indonesia, especially due to low hemoglobin levels that have an impact on concentration, learning productivity, and long-term health. Non-pharmacological efforts through consumption of fruits high in vitamin C, such as orange and strawberry, are believed to help increase hemoglobin in the body. This study aims to determine the effectiveness of giving orange juice and strawberry juice on increasing hemoglobin levels in adolescent girls with anemia in Cihideung Village in 2025. The research design used quasi experimental with two-group pretest-posttest design. The sample amounted to 30 anemic adolescent female respondents who were divided into two groups, namely 15 respondents given orange juice \pm 200 ml / day for 14 days and 15 respondents given strawberry juice \pm 200 ml / day for 14 days. The results showed a significant increase in hemoglobin levels in both groups. The average Hb level after orange juice consumption increased from 10.087 gr/dL to 12.173 gr/dL ($p=0.0001$), while after strawberry juice consumption increased from 9.820 gr/dL to 12.807 gr/dL ($p=0.0001$). Independent T test analysis showed a significant difference between the two groups with a value of $p=0.006$. Orange and strawberry juice proved effective in increasing hemoglobin levels, but the administration of strawberry juice showed higher effectiveness in adolescent girls with anemia.

Keywords: adolescent girls, anemia, hemoglobin, orange juice, strawberry juice

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BACKGROUND

Anemia is a medical condition characterized by hemoglobin (Hb) levels below the normal value, resulting in reduced capacity of the blood to transport oxygen to all body tissues. This can impair the body's physiological functions and trigger symptoms such as fatigue, dizziness, difficulty concentrating, and increased susceptibility to infections. Iron deficiency anemia (IDA), caused by a lack of iron as the raw material for hemoglobin, is the most common type of anemia and a serious health problem, especially in developing countries. IDA is highly prevalent in vulnerable age groups, including adolescents.

Adolescent girls are particularly vulnerable to anemia. This is due to the increased need for iron during puberty, blood loss during menstruation, and dietary habits that lack iron. According to data from the *World Health Organization* (WHO) in 2023, around 30% of women aged 15-49 years worldwide suffer from anemia. In Indonesia, the prevalence of anemia is still quite high. Based on the Basic Health Research (RIKESDAS) in 2021, the prevalence of anemia in adolescents aged 13-18 years reached 22.7%, which means that about 3-4 out of 10 adolescents are anemic. This prevalence is higher in females (27.2%) than males (20.35%).



Data from the West Java Health Office in 2022 showed that the prevalence of anemia in adolescent girls reached 41.93%, but the coverage of adolescent girls who received Blood Additive Tablets (TTD) in 2021 was still low, only 25.2%, far below the West Java target of 52%.

To overcome the problem of anemia, the government has initiated a TTD program for adolescent girls with a dose of one tablet per week. Each TTD tablet contains at least 60 mg of elemental iron and 0.4 mg of folic acid. This program is facilitated by puskesmas and School Health Units (UKS). However, the effectiveness of this program still faces challenges, especially the low compliance rate of TTD consumption. Based on data from the Indonesian Ministry of Health (2021), this is often due to gastrointestinal side effects, discomfort, and lack of nutrition education among adolescents.

One alternative that can support the increase of hemoglobin levels naturally and easily implemented is through the consumption of foods high in vitamin C, such as citrus fruits (*Citrus sinensis*) and strawberries (*Fragaria × ananassa*). Vitamin C plays an important role in increasing the absorption of non-heme iron by reducing ferric ions (Fe^{3+}) to ferric (Fe^{2+}), a form that is more easily absorbed by the small intestine (Lynch & Cook, 2021). In addition, oranges and strawberries are also easily accessible and popular fruits among adolescents, and can be processed into more attractive juices.

Recent scientific evidence supports the effectiveness of combining iron with vitamin C. A 2024 meta-analysis reported that iron supplementation with vitamin C significantly increased hemoglobin levels by 0.14 g/dL compared to iron alone (Zhang et al., 2024). Another study also showed that consumption of fruit juices high in vitamin C can improve hematological status, including hemoglobin and hematocrit levels (Mendoza et al., 2022).

However, studies specifically evaluating the effectiveness of orange juice and strawberry juice in improving hemoglobin levels, especially in adolescent girls with anemia, are limited.

Based on these conditions, researchers are interested in conducting research on the effectiveness of giving orange juice and strawberry juice on increasing hemoglobin levels in adolescent girls with anemia in Cihideung Village, West Bandung Regency in 2025. This research is expected to be an alternative solution that is natural, applicable, and sustainable in handling the problem of anemia in Indonesia.

METHODS

This research is a quantitative study with a quasi-experimental design approach, using a two-group pre-test-post-test design. This design involves two groups, namely the intervention group and the control group, each of which is given a pre-test before the intervention and a post-test after the intervention, although the placement of subjects is not randomized. This design aims to evaluate the effectiveness of an intervention by comparing pre-test and post-test results between the two groups (Sugiyono, 2017).

This study was conducted to determine the effectiveness of giving orange juice and strawberry juice in increasing hemoglobin levels in anemic adolescent girls in Cihideung Village, West Bandung Regency, in 2025. The research location was in the Cihideung Village environment and the implementation began in February 2025 to August 2025.

The population in this study were all adolescent girls who experienced anemia in Cihideung Village, as many as 50 people. The sample in this study was selected using purposive sampling technique, with a total sample of 30 respondents divided into two groups. Group A consisted of 15 adolescent girls with anemia who were given an intervention in the form of consumption of dates as much as ± 200 grams per day and Fe tablets at a dose of twice a day for 14 days. Group B consisted of 15 adolescent girls with anemia who were given an



intervention in the form of honey consumption for 14 days. The inclusion criteria in this study were adolescent girls aged 13-18 years with hemoglobin levels < 11 g/dL.

The exclusion criteria are adolescents who are not anemic and/or not willing to be respondents in this study. The type of data used is primary data obtained directly from the measurement results of respondents. Data collection techniques were carried out through the provision of interventions and monitoring changes in hemoglobin levels using observation sheets. The instrument used to measure hemoglobin levels was a digital “Quick Check” device.

Data collection procedures include: (1) Researchers determined the location of the study and contacted respondents who met the inclusion criteria; (2) Researchers explained the purpose and benefits of the study to prospective respondents; (3) Willing respondents signed an informed consent sheet as proof of willingness to participate; (4) Initial hemoglobin level checks were carried out before the intervention; (5) Respondents who met the criteria were given intervention according to their group for 14 days; (6) Hemoglobin level re-examination was carried out on day 14 using the same tool, and the results were recorded in the observation sheet.

Data analysis was carried out univariately, namely to describe the characteristics of respondents and bivariate to analyze differences in increasing hemoglobin levels between the two groups. Meanwhile, the statistical test used was Independent T-test to test the difference in the mean increase in hemoglobin levels between the group given dates and the group given honey. Data analysis was performed using SPSS software.

RESULTS

Table 1. Hemoglobin Level of Adolescents Before Consuming Orange Juice

	N	Mean	Std. Deviation	Min	Max
Before Consuming	15	10,087	0,5643	9,0	10,8

Orange Juice

Table 1 shows that the mean hemoglobin level of adolescents before consuming orange juice was 10.087 gr/dL with a standard deviation of 0.5643 gr/dL. The lowest hemoglobin level was recorded at 9 gr/dL, while the highest hemoglobin level reached 10.8 gr/dL.

Table 2. Hemoglobin Levels of Adolescents After Consuming Orange Juice

	N	Mean	Std. Deviation	Min	Max
After Consuming Orange Juice	15	12,173	0,5509	11,5	13,1

Table 2 shows that the mean hemoglobin level in adolescents after consuming orange juice was 12.173 gr/dL with a standard deviation of 0.5509 gr/dL. The maximum hemoglobin level was recorded at 13.1 gr/dL, while the minimum hemoglobin level was 11.5 gr/dL.

Table 3. Adolescent Hemoglobin Levels Before and After Consuming Orange Juice

	N	Mean	Std. Deviation	Std. Error	P-Value
Before Consuming Orange Juice	15	10,087	0,5643	0,1457	
After					



0,0001

Consuming	15	12,173	0,5509	0,1422
<u>Orange Juice</u>				

Table 3 shows that the average hemoglobin level of adolescents before consuming orange juice was 10.087 gr/dL, while after consuming orange juice, the average hemoglobin level of adolescents increased to 12.173 gr/dL. The statistical analysis results showed a p-value = 0.0001 indicating a significant difference in the hemoglobin levels of adolescents before and after consuming orange juice.

Table 4. Adolescent Hemoglobin Levels Before Consuming Strawberry Juice

	N	Mean	Std. Deviation	Min	Max
Before Consuming Strawberry Juice	15	9.820	0.9503	8.0	10.8

Table 4 shows that the mean hemoglobin level in adolescents before consuming Strawberry Juice was 9.820 gr/dL with a standard deviation of 0.9503 gr/dL. The lowest hemoglobin level was recorded at 8 gr/dL, while the highest hemoglobin level reached 10.8 gr/dL.

Table 5. Adolescent Hemoglobin Levels After Consuming Strawberry Juice

	N	Mean	Std. Deviation	Min	Max
After Consuming Strawberry Juice	15	12,807	0,6216	12,0	13,9

Strawberry Juice

Table 5 shows that the mean hemoglobin level in adolescents after consuming Strawberry Juice was 12.807 gr/dL with a standard deviation of 0.6216 gr/dL. The highest hemoglobin level recorded was 13.9 gr/dL, while the lowest level was 12.0 gr/dL.

Table 6. Adolescent Hemoglobin Levels Before and After Consuming Strawberry Juice

	N	Mean	Std. Deviation	Std. Error	P-Value
Before Consuming Strawberry Juice	15	9,820	0,9503	0,2454	0,0001
After Consuming Strawberry Juice	15	12,807	0,6216	0,1605	

Table 6 shows that the average hemoglobin level of adolescents before consuming Strawberry Juice was 9.820 gr/dL with a standard deviation of 0.9503 gr/dL. After consuming Strawberry Juice, the average hemoglobin level of adolescents increased to 12.807 gr/dL with



a standard deviation of 0.6216 gr/dL. Statistical test results showed a p value = 0.0001, indicating a significant difference in adolescent hemoglobin levels before and after consuming Strawberry Juice.

Table 7. Statistical Analysis of the Effectiveness of consuming Orange Juice and Strawberry Juice in Increasing Hemoglobin Levels in Anemic Adolescents

	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error</i>	<i>P-Value</i>
Hb Levels After Consuming	15	12,173	0,5509	0,1422	
Orange Juice					0,006
Hb Levels After Consuming	15	12,807	0,6216	0,1605	
Strawberry Juice					

Table 7 based on the research, it was found that the average hemoglobin level in anemic adolescents after consuming Orange Juice was 12.173 gr/dL with a standard deviation of 0.5509 gr/dL. Meanwhile, the average hemoglobin level in adolescents with anemia after consuming Strawberry Juice was 12.807 gr/dL with a standard deviation of 0.1605 gr/dL. The results of statistical analysis using Independent T Test showed a value of p = 0.006, which means p < 0.05, so there is a significant difference in hemoglobin levels between groups consuming Orange Juice and Strawberry Juice.

DISCUSSION

Anemia is a pathological condition characterized by a decrease in hemoglobin (Hb) levels in the blood below the normal threshold, which is <11 gr/dL according to WHO (2023). Hemoglobin is the main component in erythrocytes that plays an important role in binding and transporting oxygen from the lungs to all body tissues and carrying carbon dioxide back to the lungs. When hemoglobin levels decrease, oxygen distribution in the body is disrupted, which can lead to symptoms such as fatigue, dizziness, decreased concentration, and decreased learning productivity, especially in adolescents.

Adolescent girls are the most vulnerable group to iron deficiency anemia due to several factors, including regular blood loss during menstruation, increased iron demand during growth, and dietary habits low in iron and other essential micronutrients. WHO data (2023) states that about 1 in 4 adolescent girls experience anemia. In West Bandung Regency, the prevalence is as high as 32.8%, indicating the need for effective, natural and acceptable nutritional interventions.

Oranges and strawberries are fruits that are rich in vitamin C, flavonoids, and antioxidants. Vitamin C plays an important role in assisting the absorption of non-heme iron (iron from plant sources) in the digestive tract, by reducing ferric iron ions (Fe³⁺) to the ferric form (Fe²⁺) which is more easily absorbed by the small intestine (Lynch & Cook, 2021). In addition, strawberries also contain folate, which supports the process of red blood cell formation. Therefore, consumption of orange juice and strawberry juice is believed to be effective in increasing hemoglobin levels in adolescents with anemia.

In this study, orange juice was given as much as ±200 ml per day for 14 days. The results showed that the hemoglobin level increased from an average of 10.087 gr/dL to 12.173 gr/dL with a p value = 0.0001, which indicates a statistically significant increase. This result is supported by research from Setyawati et al. (2021) which states that consumption of orange juice for two weeks can significantly increase hemoglobin levels in adolescent girls with mild



to moderate anemia.

Meanwhile, the group given strawberry juice as much as ± 200 ml per day for 14 days experienced an increase in hemoglobin levels from an average of 9.820 gr/dL to 12.807 gr/dL, also with a p value of 0.0001. This increase is statistically significant and shows the effectiveness of strawberry juice in supporting the formation of red blood cells. This is in line with research from Arifah & Lestari (2022) which shows that strawberry contains folic acid, vitamin C, and anthocyanins that contribute to increasing hemoglobin levels in anemic adolescents.

The study conducted by Herlina et al. (2020) also proved that consumption of strawberry juice for 10 days can significantly increase hemoglobin levels, especially when combined with iron intake from staple foods. In addition, Yuliani & Mardiyanti (2019) stated that the combination of vitamin C from fruit and iron supplements can increase iron bioavailability up to two times compared to iron administration alone.

Based on the analysis conducted using Independent T-test in Table 7, compared the effectiveness between the administration of orange juice and strawberry juice on increasing hemoglobin levels in adolescent girls with anemia in Cihideung, West Bandung Regency, 2025, the results showed that the average hemoglobin level after administration of orange juice was 12.173 gr/dL with a standard deviation of 0.5509 gr/dL. While the average hemoglobin level after giving strawberry juice is 12.807 gr/dL with a standard deviation of 0.6216 gr/dL. Statistical tests showed a p value = 0.0001 ($p < 0.05$), so it can be concluded that there is a significant difference between the groups consuming orange juice and strawberry juice.

These findings suggest that vitamin C-rich fruit juices such as orange and strawberry can be used as complementary therapy in overcoming anemia, especially in adolescent girls. In addition, this natural food-based intervention does not cause side effects, is culturally acceptable, and can be used as an alternative to improve compliance with the Blood Addition Tablet (TTD) program which still faces obstacles in its implementation.

With a simple and economical approach, orange and strawberry juicing can be integrated into nutrition programs in schools and adolescent communities. These easily available local fruits not only act as functional foods, but also have great potential in supporting adolescent health and preventing the long-term effects of anemia.

CONCLUSION

Based on the results of the research and data analysis that has been done, it can be concluded that the administration of orange juice and strawberry juice is equally effective in increasing hemoglobin levels in anemic adolescent girls. Both natural interventions are proven to provide significant improvement after being given for 14 days. However, the administration of strawberry juice showed higher effectiveness than orange juice, with statistically greater mean hemoglobin levels with a p value < 0.05 . This finding suggests that strawberry juice can be used as a potential and applicable alternative natural therapy in efforts to overcome adolescent anemia.

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