The Effect of Combined Consumption of Iron Tablets with Vitamin C (Ascorbic Acid) Tablets and Guava Fruit on Hemoglobin Levels in Adolescent Girls with Anemia at the As-Saruniyah Health Center in Cianjur Regency in 2025

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ABSTRACT

Anemia often affects adolescent girls due to psychological conditions that often cause stress, menstruation, or unhealthy lifestyles, especially in terms of nutritional needs. The purpose of this study was to determine the effectiveness of consuming iron tablets combined with vitamin C and guava fruit in increasing hemoglobin levels in adolescent girls with anemia at the As-Saruniyah Health Center in Cianjur Regency. The research method used was quasi-experimental (Quasi Experimental Design), with a Nonequivalent Control Group Design. The sample size was 30 adolescent girls, divided into an intervention group and a control group, selected using purposive sampling. The research was conducted in August 2025. Data analysis was performed using univariate and bivariate analysis with the Paired T-Test (T Dependent) and the Difference Test using the independent T-test. The results showed an average increase in Hb of 1.24 g/dL, with a statistical test result of P-value $0.0001 < \alpha$ (0.05) in the guava group and an average increase in Hb of 1.18 g/dL, with a statistical test result of P-value $0.0001 < \alpha$ (0.05) in the vitamin C group. Meanwhile, the difference test results showed an average difference of 0.13 g/dL. The statistical test results showed a P-value of $0.768 > \alpha$ (0.05), indicating that there was no significant difference between the effects of the combination of iron tablets with guava and vitamin C. It is hoped that this study can provide an alternative way of consuming iron tablets.

Keywords: Anemia, hemoglobin, guava, adolescent girls, vitamin C

Introduction

Anemia is a nutritional problem that is prevalent throughout the world, occurring not only in developing countries but also in developed countries. An estimated two billion people suffer from anemia, with the highest prevalence in Asia and Africa. The World Health Organization (WHO) states that anemia is one of the ten biggest health problems of the modern era. High-risk groups for anemia include women of childbearing age, pregnant women, school-age children, and adolescents (Kemenkes, 2020).

According to the World Health Organization (WHO), adolescents are people aged 10-19 years, while according to the National Population and Family Planning Agency (BKKBN), adolescents are people aged 10-24 years who are not yet married. Adolescence is a transitional stage of development from childhood to adulthood. According to Indonesian Minister of Health Regulation No. 25 of 2014, adolescents are individuals aged 10-18 years (Diananda, 2019).

Indonesia is one of the developing countries with a high prevalence of anemia. This has resulted in Indonesia ranking 17th among countries with the most significant health problems in the world. According to the 2023 Indonesian Health Survey (SKI) report on adolescents aged 15-24 years, 15.5% of adolescents were recorded as having anemia, with 18% of adolescent girls and 14.4% of adolescent boys affected (Kemenkes, 2023).

Data from the West Java Health Office Profile indicates that 40% or approximately 1.7 million female adolescents suffer from anemia (Abdussalam, 2022). According to Cincin Nuryanti, anemia in Cianjur Regency ranks third highest in West Java after Cirebon and Majalengka, with a prevalence of more than 15% among female adolescents (Lestari et al., 2023).

According to a 2018 survey by the Cianjur Health Office, out of 1,200 female students in 12 schools, 559 students (46.58%) were diagnosed with anemia. Low economic factors contributed to poor nutrition, which was the main cause of this high rate. Meanwhile, the latest data from the Cianjur District Health Office's annual report shows that the incidence of anemia among adolescent girls in 2023 reached 29.45%. Although the incidence rate from 2018 to 2023 has decreased according to surveys and reports, this figure is still above the national prevalence in the same year. The Campaka Community Health Center has 11 villages under its supervision. According to data reported by nutrition officers in 2024, 162 adolescent girls (57.04%) out of 284 examined were found to have anemia, consisting of 91 adolescents (32.04%) with mild

anemia, 70 adolescents (24.65%) had moderate anemia, and 1 adolescent (0.35%) had severe anemia.

Short-term effects that may arise include anemia reducing the immune system of sufferers, making them susceptible to infectious diseases. In addition, anemia can also cause a lack of oxygen to muscle and brain cells, which can cause a decline in the fitness and agility of adolescent girls, which of course can lead to a decline in academic achievement and work productivity/performance (Kemenkes, 2018).

The long-term impact of anemia in adolescent girls and women of childbearing age will carry over into pregnancy, resulting in anemia in pregnant women, which can cause bleeding before and during childbirth that can threaten the safety of the mother and her baby. Meanwhile, babies carried by mothers with a history of anemia may experience Fetal Growth Restriction (FGR), premature birth, low birth weight, and child growth and development disorders, including stunting and neurocognitive disorders. Babies born with low iron reserves

will continue to suffer from anemia in infancy and early childhood, which can increase the risk of neonatal and infant morbidity and mortality (Kemenkes, 2018).

To address this issue, there are two approaches that can be taken to treat and prevent anemia: pharmacological and non- pharmacological. The pharmacological approach involves taking one 60 mg iron tablet once a week (Alami Wulandari et al., 2022). Meanwhile, the non-pharmacological approach involves consuming fruits, vegetables, and leaves in the form of drinks, puddings, or extracts, which can also be combined with fruits or vegetables. One example is the use of a combination of red guava juice and dates as an option for treating anemia (Witjaksono, 2019).

Vitamin C is a water-soluble ascorbic acid. The Recommended Daily Allowance (RDA) for vitamin C is 45 mg – maximum 1200 mg/day (9- 13 years old), 75 mg for men and 65 mg – maximum 1800 mg/day (14-18 years old) for women. Vitamin C can be obtained from several types of fruit (per 100 grams of fruit), including guava (197 mg), jamblang (130 mg), white guava (116 mg), gandaria (111 mg), mango (61 mg), sweet orange (49 mg), red guava (42.9 mg), and apple (5 mg) (Padang, 2019).

Based on this, the researchers considered it necessary to conduct further research on the effect of the combination of guava and vitamin C with iron tablets on the increase in hemoglobin levels.

Materials and Methods

This study is a quantitative study using a quasi-experimental research method (Quasi Experimental Design), with a Nonequivalent Control Group Design. Neither the experimental group nor the control group were selected randomly. The experimental and control groups underwent initial testing. Both groups received different interventions, whereby the experimental group consumed iron tablets combined with guava fruit and the control group consumed iron tablets combined with vitamin C (ascorbic acid), followed by a re-examination of Hb levels.

According to Roscoe (Sugiyono, 2022), for simple experimental research using an experimental group and a control group, the sample size should be between 10 and 20. Therefore, this study took a sample of 15 adolescent girls in the control group and 15 adolescent girls in the intervention group. In this study, the researcher determined the samples in both groups randomly according to the order of attendance at the hemoglobin examination at the beginning of the study, so there were no specific criteria for entering one research group but could still answer the problems in this study.

The exclusion criteria in this study were students who were unwilling, lived far away, had chronic diseases, had a history of thalassemia, and were menstruating.

To test the normality of the data, the data distribution was tested using the Shapiro Wilk test, which yielded a p-value >0.005, indicating that the data distribution was normal. Therefore, to determine the effect of the intervention, the Paired T-test (Dependent sample t-test) was used, and to test the difference in effectiveness, the Independent sample T-test was used.

This study has obtained ethical approval from the Health Research Ethics Committee of Jenderal Achmad Yani University, Cimahi.

Results and Discussion

This study was conducted in August 2025 with a sample of 30 adolescent girls at the As- Saruniyah Islamic Boarding School in Cianjur, West Java, divided into two groups: an intervention group and a control group.

This study was conducted using a quasi- experimental research method (Quasi Experimental Design), specifically a Nonequivalent Control Group Design, which aimed to determine the effect of the combination of iron tablets and guava on Hb levels, the effect of the combination of iron tablets and vitamin C on Hb levels, and the effectiveness of both interventions on Hb levels.

In this study, pre-tests and post-tests were conducted in the form of Hb level examinations on female adolescents at the As-Saruniyah Islamic Boarding School before and after treatment was given to both groups, as illustrated in the following table:

Table 1. Distribution of anemia in adolescent girls before intervention at Postem As-Saruniyah, Campaka District, Cianjur Regency 2025

Variable	Category	Groups				Total	
		Intervention		Control			
		n	%	n	%	n	%
Pretest Hb Level	Sever Anemia	0	0.0	1	6.7	1	3.3
	Mild Anemia	5	33.3	8	53.3	13	43.3
	Moderate Anemia	10	66.7	6	40.0	16	53.3
Total		15	100	15	100	30	100

The description of anemia in adolescent girls before the intervention was that a small percentage had severe anemia, with one respondent (3.3%) in the control group, and the

majority had moderate anemia, with 16 respondents (53.3%), including ten in the intervention group and six in the control group.

Based on the results of a study conducted at the As-Saruniyah Islamic Boarding School, Campaka District, Cianjur Regency, it was shown that of the 30 respondents in this study, a small proportion (one respondent (3.3%) in the control group had severe anemia, and the majority (16 respondents (53.3%) had moderate anemia: ten in the intervention group and six in the control group.

According to Sugeng Jutowiyono (2018), adolescence is the most critical period for development in future life stages. Iron requirements for girls are higher than for boys because girls menstruate every month, resulting in greater iron loss. Therefore, girls are more susceptible to anemia than boys. Furthermore, Sugeng explained that iron requirements for girls increase due to increased growth and expansion of blood volume and muscle mass during this period (Dewi et al., 2019).

The WHO (2016) also explains that girls and women of childbearing age who menstruate lose blood every month, requiring twice as much iron during menstruation. Girls and women of childbearing age also sometimes experience menstrual disorders, such as longer-than-usual periods or heavier menstrual bleeding. This is a contributing factor to anemia in girls and can be exacerbated if girls do not receive iron supplementation (Kemenkes, 2018).

In Indonesia, it is estimated that most anemia occurs due to iron deficiency, resulting from insufficient intake of iron-rich foods, particularly animal-based foods (heme iron). The main sources of iron are animal-based foods (heme iron), such as liver, meat (beef and lamb), poultry (chicken, duck, and birds), and fish. The body absorbs between 20-30% of the iron in animal-based foods (heme iron) (Kemenkes, 2018).

This aligns with the results of research conducted by Eka Rati Astuti (2023), which explains that adolescence is the transition from childhood to adulthood (Rosyida, 2020). During adolescence, a person experiences rapid physical growth. More than 20% of total growth is in height and up to 50% in bone growth. Peak growth occurs approximately 12-18 months before the first menstruation (Briawan, 2020).

Factors influencing the incidence of anemia include menstruation (P-value = 0.001), as well as the desire for a slimmer stomach among adolescent girls (62.7% were anemic and 37.3% were not anemic). There is a relationship between nutritional status and the incidence of anemia (nutritional status showed that 82% of adolescents were anemic and 28% were not anemic), and there is a relationship between dietary habits and the incidence of anemia. The

conclusion is that the incidence of anemia in adolescents is related to knowledge, menstruation, and dietary habits (Rati Astuti, 2023).

As-Saruniyah Islamic Boarding School (Pesantren As-Saruniyah) is a youth health post (Posyandu) and a community-based health facility specifically designed for adolescents aged 10-24. Initial data collection, including interviews with administrators, revealed that adolescent girls at the Islamic boarding school were not receiving blood tablets regularly. Consequently, one girl had severe anemia, 20 had moderate anemia, and 16 had mild anemia. This resulted in a total of 37 out of 56 adolescent girls experiencing anemia.

The As-Saruniyah Islamic Boarding School was originally a local Islamic boarding school with traditional teachings. Students aged 13-15 were given the freedom to choose their daily meals. Students were taught to independently prepare their own meals in groups, using the supplies they brought and their abilities. Therefore, the criteria for balanced nutrition were not yet met by standards. This also became one of the factors that could affect the health conditions, especially anemia status, of the students.

Table 2. Distribution of anemia in adolescent girls after intervention at Postem As-Saruniyah, Campaka District, Cianjur Regency 2025

Variable	Category	Groups				Total	
		Intervention		Control			
		n	%	n	%	n	%
Pretest Hb Level	Moderate Anemia	3	20.0	3	20.0	6	230.0
	Mild Anemia	5	33.3	4	26.7	9	30.0
	Normal Hb	7	46.7	8	53.3	15	50.0
Total		15	100	15	100	30	100

Of the respondents who received the combined supplementation treatment in both groups in this study, a small proportion (6 respondents) experienced moderate anemia (20%), three in the intervention group and three in the control group. Half of these respondents experienced an increase in Hb levels to normal (15 respondents (50%), seven in the intervention group and eight in the control group.

According to the Ministry of Health (2018), efforts that can be made to prevent and overcome anemia are increasing the intake of food sources of iron, fortifying food with iron and iron supplementation. This is in line with global recommendations that recommend for areas with anemia prevalence $\geq 40\%$, the provision of iron supplements for adolescent girls and women of childbearing age consists of 30-60 mg of elemental iron and is given daily for 3

consecutive months in 1 year (WHO, 2016). Meanwhile, for areas with anemia prevalence ≥ 20%, supplementation consists of 60 mg of elemental iron and 2800 mcg. Anemia Prevention and Management Program for Adolescent Girls and Women of Childbearing Age folic acid and is given once a week for 3 months on (given) and 3 months off (not given) (WHO, 2011) (Kemenkes, 2018)

Research conducted at the At Tanwir Wedung Islamic Boarding School in 2023 on adolescent girls showed that weekly iron supplementation for 16 weeks significantly increased hemoglobin and serum ferritin levels compared to iron supplementation for four consecutive days during menstruation for four menstrual cycles (Yulisetyaningrum et al., 2023).

Research conducted on high school students in Tasikmalaya by Susanti showed that administering iron tablets once a week, compared with administering iron tablets once a week plus daily for 10 days during menstruation, increased Hb levels by 0.48 to 1.04 g/dL, but there was no significant difference between the two groups (Sudikno & Sandjaja, 2016).

In several other countries, such as India, Bangladesh, and Vietnam, weekly iron tablets have successfully reduced the prevalence of anemia. Based on research in Indonesia and several other countries, the government has established a program policy for administering iron tablets to adolescent girls and women of childbearing age (WUS) once a week, in accordance with the applicable Ministry of Health Regulation. Iron tablets are administered to adolescent girls and women of childbearing age (WUS) using a blanket approach (Kemenkes, 2020).

Global recommendations recommend that for areas with an anemia prevalence of 40% or more, iron supplementation for adolescent girls and women of childbearing age (WUS) consist of 30-60 mg of elemental iron daily for 3 consecutive months within one year (WHO, 2016). For areas with an anemia prevalence of 20% or more, supplementation consists of 60 mg of elemental iron and 2,800 mcg of folic acid, administered once a week for 3 months on and 3 months off (WHO, 2011) (Kemenkes, 2018).

According to experts, consuming iron in the morning is effective because the body has just had a long sleep and at this time calcium and iron levels are at their lowest. Therefore, consuming iron in the morning is highly recommended by experts. Iron is best absorbed during fasting, as various foods reduce the absorption of this important micronutrient. It's best to consume iron 30 minutes before breakfast or 2 hours after breakfast (Nguyen, 2025). Young women are recommended to take one iron supplement tablet daily during menstruation and one tablet weekly outside of their menstrual cycle. This totals approximately 13 tablets per month (Ristanti et al., 2023).

Vitamin C, or ascorbic acid, also acts as an enhancer, accelerating iron absorption. Consuming iron-enhancing sources of iron, such as vitamin C, without consuming iron-rich foods, will have a negligible impact on iron availability. Vitamin C is also useful in increasing the absorption of non-heme iron by fourfold. Vitamin C and iron form a complex, soluble and readily absorbed compound (Briawan, 2020).

The Recommended Daily Allowance (RDA) for vitamin C for adolescent girls is 65 mg, with a maximum daily intake of 1,800 mg Guava (Psidium guajava L. cv. kristal) is a large guava variety with an asymmetrical shape and white flesh with a crunchy texture. Crystal guava has a sweet taste and lacks the numerous seeds of red guava. According to Novita et al. (2016), the nutritional content of crystal guava includes vitamin C, vitamin A, dietary fiber, polyphenols, and carotenoids. Crystal guava contains higher levels of vitamin C than oranges, strawberries, and papaya (Putri et al., 2023).

Guava has the highest vitamin C content compared to other fruits. White guava contains 116 mg of vitamin C per 100 grams of fruit, while red guava contains 42.9 mg per 100 grams. The vitamin content of guava fruit peaks when it is nearly ripe. This causes differences in vitamin C and other chemical content. Based on a 1991 chemical quality study conducted by research staff at the Sunday Market Research Agency, the vitamin C content per 100 grams of ripe guava is 150.50 mg, optimally ripe guava contains 130.13 mg, and overripe guava contains 132.24 mg.

Achmad Syaiful Hadi, in his journal, stated that consuming guava in moderate amounts has no specific side effects. He also explained several benefits of consuming guava (Annisa, 2020), namely; Antioxidant (ellagic acid, gallic acid, leukocyanidin, and quercetin), High in vitamin C, Helps improve erythrocyte membrane health and protect the body from free radicals, Increases iron absorption by up to 30%, Contains vitamin B12, vitamin B6, and folic acid. Guava fruit has been extensively studied for the pharmacological activity of its main components, showing antioxidant, antipyretic, antifungal, antimicrobial, antihypotensive, analgesic, and anti-inflammatory effects (Masud Parvez, 2018).

Bivariate analysis in this study was conducted to determine the effect of guava and vitamin C on Hb levels and to determine the effectiveness of guava and vitamin C on Hb levels. The results showed that the average Hb level before treatment in the intervention group was 10.6 g/dL. After treatment with iron tablets and guava, the average Hb level increased to 11.84 g/dL, with an average increase of 1.24 g/dL. The statistical test results obtained a P- value of $0.0001 < \alpha$ (0.05). This indicates that Ha is accepted and Ho is rejected, indicating a significant effect of the combination of iron tablets and guava on increasing Hb levels.

Table 3. Effect of the combination of iron tablets and guava on the average increase in Hb levels in the intervention group at the As-Saruniyah Islamic Boarding School, Campaka District, Cianjur Regency, 2025

	Mean	Standar Deviation	P-Value
Hb Pretest	10.60	0.9396	0.0001
Hb Posttest	11.84	0.9679	

These results align with research conducted by Putri (Panglipur et al., 2024), which reported that guava is the fruit with the highest vitamin C content. Iron can be absorbed fourfold with a 200 mg intake and also accelerates drug absorption by at least 30%. Guava fruit contains twice the ascorbic acid of oranges, at 116 mg/100 g. The high vitamin C content in guava fruit is very beneficial in iron absorption in the body, thereby increasing hemoglobin levels in the blood. This study showed that administering crystal guava juice had an effect on increasing hemoglobin levels with a p-value of 0.001 <0.05 at the Kareng Bingkarai Community Health Center in Palangka Raya City (Putri et al., 2023).

In this study, respondents were given iron tablets to be taken in the morning for 14 consecutive days with water. They then ate approximately 86 grams of guava fruit. According to the respondents, this amount was sufficient for a single meal, and they did not experience any side effects during the study.

Table 4. Effect of the combination of iron tablets and vitamin C (ascorbic acid) on the average increase in Hb levels in the intervention group at the As-Saruniyah Islamic Boarding School, Campaka District, Cianjur Regency, in 2025

	Mean	Standar Deviation	P-Value
Hb Pretest	10.54	1.3516	0.0001
Hb Posttest	11.72	1.5066	

The results of the study showed that the average Hb level before treatment in the control group was 10.54 g/dL. After treatment with iron tablets and vitamin C (ascorbic acid), the average Hb level increased to 11.72 g/dL, with an average increase of 1.18 g/dL. The statistical test results obtained a P-value of $0.0001 < \alpha$ (0.05). This indicates that Ha is accepted and Ho is rejected, indicating a significant effect of the combination of iron tablets and vitamin C (ascorbic acid) on increasing Hb levels.

Islamic Boarding School, Campaka District, Cianjur Regency. The results of this analysis used a paired t-test (dependent sample t-test) with SPSS, where the average increase

in hemoglobin was 1.18 g/dL. Vitamin C is useful in increasing the absorption of non-heme iron fourfold. Vitamin C and iron form a complex absorption compound that is soluble and easily absorbed by the body (Briawan, 2020). Research conducted by Kusdilanah (2023) showed an increase in Hb during 14 days of iron tablet consumption combined with vitamin C of 2.62 g/dL, with a p-value of 0.0005< 0.005. The results of this experimental study indicate a significant increase in hemoglobin levels in adolescent girls during the 14-day study (Kusdalinah et al., 2023). Another study also found a lower average increase in hemoglobin of 0.593 mg/dL compared to those taking iron tablets and vitamin C. Another similar finding was an increase in hemoglobin levels in adolescent girls who received a six-week nutritional intervention (Kurniati, 2020).

In this study, respondents were given iron tablets to be taken in the morning for 14 consecutive days with water. Then, they took two 50 mg tablets of vitamin C (ascorbic acid) by sucking. Respondents did not experience any side effects during the study.

Table 5. Effectiveness of the Effect of the Combination of Iron Tablets and Guava on the Average Increase in Hb Levels in the Intervention Group at the As-Saruniyah Islamic Boarding School, Campaka District, Cianjur Regency in 2025

	Group	Mean	Standar Deviation	P-Value
Hb Posttest	Intervention	11.84	0.9679	0.786
	Control	11.72	1.5066	

The results of the study showed that the average Hb level in the intervention group after being given treatment was 11.84 gr/dL and the average Hb level in the control group after being given treatment was 11.71 gr/dL, with an average difference of 0.13 gr/dL. The results of the statistical test obtained a P-value of 0.768> α (0.05), this indicates that Ho is accepted and Ha is rejected, which means there is no significant difference between the effectiveness of the combination of Fe tablets with guava and Fe tablets with vitamin C (Ascorbic Acid) on the increase in average Hb levels.

This means there is no significant difference between the effect of the combination of iron tablets and guava and the effect of the combination of iron tablets and vitamin C on the increase in average hemoglobin levels after treatment. This indicates that both can be equally effective alternatives for maximizing iron absorption from iron tablets. The results of this analysis using an Independent Sample T-test with SPSS showed that the average post-intervention hemoglobin level in the intervention group was 11.84 g/dL and in the control group was 11.71 g/dL. The vitamin C content of crystal guava is higher than that of oranges,

strawberries, and papaya. Prabawaningrum et al., (2020). Vitamin C contained in white guava is 116 mg/100 grams of fruit while in red guava it is 42.9/ 100 gram guava.

In this study, researchers used vitamin C in the form of ascorbic acid (100 mg) and the equivalent of 100 mg of vitamin C from crystallized guava. Using a mathematical equation, it was found that to obtain 100 mg of vitamin C, approximately 86 grams of guava fruit are required. This study demonstrated similar benefits between the combination of iron tablets and guava and vitamin C. Ripe guava, with its skin and seeds, can help relieve constipation due to its high fiber content, which supports digestion (Ningtias & Panggayuh, 2017).

Unlike guava, which is a non- pharmacological therapy, the potential toxicity of excessive doses of vitamin C supplements is related to intra-intestinal events and metabolite effects in the urinary system. Gastrointestinal disturbances can occur after consuming as little as 1 gram because approximately half of the amount is not absorbed. (Briawan, 2020)

Conclusion

Based on the research results and discussion of the effect of consuming a combination of iron tablets, vitamin C (ascorbic acid) tablets, and guava fruit on hemoglobin levels in adolescent girls with anemia at the As-Saruniyah Islamic Boarding School in Cianjur Regency, the following conclusions can be drawn:

The hemoglobin levels of adolescent girls at the As-Saruniyah Islamic Boarding School before the intervention were as follows: a small percentage (3.3%) experienced severe anemia, while the majority (16 respondents) experienced moderate anemia (53.3%), with ten in the intervention group and six in the control group. The hemoglobin levels of adolescent girls at the As-Saruniyah Islamic Boarding School after the intervention were as follows: a small percentage (20%) experienced moderate anemia, with three in the intervention group and three in the control group. Half of the respondents had experienced an increase in Hb levels to normal (15 respondents (50.0%), with seven in the intervention group and eight in the control group.

There was a significant effect between the administration of a combination of iron tablets and guava on increasing Hb levels in the intervention group at the As-Saruniyah Islamic Boarding School, Campaka District, Cianjur Regency, with a p-value of 0.0001. There was a significant effect between the administration of a combination of iron tablets and vitamin C (ascorbic acid) on increasing Hb levels in the control group at the As- Saruniyah Islamic Boarding School, Campaka District, Cianjur Regency, with a p-value of 0.0001. There was no significant difference between the effectiveness of the combination of iron tablets and guava

and the combination of iron tablets and vitamin C on increasing average Hb levels after treatment, with a p-value of 0.786

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