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EVE 3 BIBOTE Soft Candies: A Functional Food Intervention for Anemia in Adolescent Girls

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Abstract: Anemia remained a significant public health issue among adolescent girls due to increased iron requirements and inadequate dietary intake. This study aimed to evaluate the effect of a functional food innovation, a soft candy formulated from beetroot, carrot, and broccoli (Eve 3 Bibote), on improving hemoglobin levels among anemic adolescent girls. The research was conducted at SMKN 1 Gunung Putri, Bogor Regency, in 2025 using an experimental design with pre- and post-intervention measurements. Participants were adolescent girls diagnosed with anemia who consumed the soft candy for a specified intervention period. Hemoglobin levels were measured before and after the intervention to assess the effect. The findings showed a significant increase in hemoglobin levels after the administration of the soft candy, indicating its potential as a complementary approach for anemia management. This study concluded that the functional combination of beetroot, carrot, and broccoli in soft candy form was effective in supporting hemoglobin improvement among adolescent girls with anemia. The results highlighted the potential application of plant-based functional foods in school-based nutrition programs to reduce anemia prevalence in adolescents.

Keywords: adolescent girls, anemia, Eve 3 Bibote, functional food, hemoglobin

INTRODUCTION

Anemia remains one of the most prevalent public health problems worldwide, affecting both developing and developed countries (Sholikhah et al., 2021). Although it can occur at any stage of life, adolescent girls, women of reproductive age, and pregnant women are the groups most at risk. Globally, the prevalence of anemia among adolescents ranges between 40–88%, while in developing countries it reaches 53.7% (Abdilahi et al., 2024). In Indonesia, data from the *Riskesdas* (Basic Health Research) reported that the prevalence of anemia among individuals aged 15–24 years reached 32%. In West Java, the prevalence remains high, with iron tablet (TTD) consumption coverage only at 25.2% of the targeted 52% (Ruqaiyah et al., 2025). This indicates that adolescent girls are particularly vulnerable to anemia, largely due to monthly blood loss during menstruation (Ilmawari et al., 2025; Ruqaiyah et al., 2025).

The impact of anemia on adolescent girls is not limited to physical complaints such as fatigue, dizziness, and reduced concentration, but also extends to decreased learning capacity, physical performance, and immune function (Basniati & Sulastri, 2023; Hardiansyah et al., 2024). In the long term, untreated anemia can reduce the quality of future generations by increasing maternal morbidity and mortality and by affecting fetal development (Kharate & Choudhari, 2024; Utama, 2021). Therefore, addressing anemia among adolescent girls is an urgent priority.

The Indonesian government has implemented strategies to control anemia, including the provision of iron tablets (TTD) as mandated by Ministry of Health Regulation No. 88/2014 (Pabidang et al., 2025). While this policy is crucial, adherence to TTD consumption among adolescents remains low. Side effects such as gastrointestinal discomfort, along with the unpleasant taste and odor, have been reported as major reasons for low compliance (Masfufah et al., 2022; Wardani, 2024). According to Riskesdas 2018, 31.8% of adolescents reported discomfort as the reason for refusing TTD (Kementerian Kesehatan Republik Indonesia, 2022). This gap between policy and actual implementation underscores the need for alternative interventions that are more acceptable to adolescents.

Recent studies have highlighted the potential of functional foods as alternative interventions for anemia. Aulia et al. (2017) and Novianti (2009) demonstrated that carrot juice did not cause toxic effects in animal studies, even at high doses, confirming its safety. A clinical study by Astuti et al. (2019) showed that supplementation with 100 g of carrot and guava juice combined with iron significantly increased hemoglobin levels by 1.8 g/dL within one month. Similarly, Armini et al. (2017) reported that daily consumption of 150 g carrot juice increased hemoglobin levels in cervical cancer patients, although the increase was modest due to the short intervention period. These findings underline the potential role of plant-based sources such as beetroot, carrot, and broccoli—rich in iron, beta-carotene, and vitamin C—in supporting hemoglobin synthesis.

However, studies combining beetroot, carrot, and broccoli into a single formulation remain scarce, particularly in forms that are attractive to adolescents. The synergistic effect of these ingredients is noteworthy: iron as the main component of hemoglobin, beta-carotene as a precursor of vitamin A that supports erythropoiesis, and vitamin C that enhances the absorption of non-heme iron by up to 30%. Soft candy formulations provide a promising approach, as they are palatable, convenient, and have a relatively long shelf life—characteristics that could improve adherence among adolescents compared to conventional iron supplementation.

Based on this research gap, the present study aims to analyze the effectiveness of soft candies made from beetroot, carrot, and broccoli (EVE 3 BIBOTE) in improving anemia among adolescent girls at SMKN 1 Gunung Putri, Bogor Regency. The study contributes to the literature by offering an innovative food-based intervention for anemia that is more acceptable to adolescents. Furthermore, it supports the government's efforts in reducing anemia prevalence through sustainable, functional food strategies.

In conclusion, this research is expected to provide both scientific and practical contributions to adolescent health promotion, serving as a reference for future programs and interventions targeting anemia in Indonesia.

METHOD

This study employed a quantitative experimental design using a one group pretest–posttest approach (Sekaran & Bougie, 2016; Sugiyono, 2022). The research was conducted at SMKN 1 Gunung Putri, Bogor Regency, from July to August 2025. Ethical approval was obtained from the Research Ethics Committee of STIKes Dharma Husada Bandung, and informed consent was secured from all participants as well as school authorities. The study population consisted of adolescent girls aged 16–17 years who were identified as having mild

iron deficiency anemia based on health records from the school health unit (*UKS*) and the Gunung Putri Community Health Center. A multistage sampling technique was applied (Sugiyono, 2022). Initial screening was carried out using self-reported anemia-related symptoms such as fatigue, weakness, dizziness, and forgetfulness, combined with clinical signs including conjunctival pallor and capillary refill time. Eligible participants were then selected randomly. Using the Slovin formula with a 95% confidence level and a margin of error of 0.05, a minimum of 88 respondents was determined and included in the study (Suyanto & Salamah, 2018).

The inclusion criteria were adolescent girls diagnosed with mild anemia who were willing to consume the intervention product daily during the study period and attend all follow-up measurements. Exclusion criteria included comorbid conditions such as hypertension, diabetes, or liver disease, as well as abnormal uterine bleeding or hematologic disorders. Respondents were excluded from analysis if they failed to consume the product as prescribed for 14 days or were absent during the final evaluation (Suyanto & Salamah, 2018).

The intervention product was a soft candy named EVE 3 BIBOTE, formulated from beetroot, carrot, and broccoli. Each piece contained 250 mg beetroot extract, 250 mg carrot extract, 250 mg broccoli extract, and 750 mg gelatin. Respondents consumed two pieces daily after lunch for 14 consecutive days. Hemoglobin levels were measured twice using a spectrophotometer with the cyanmethemoglobin method, once before the intervention (pre-test) and once after 14 days of intervention (post-test). An increase of at least 1.0 g/dL in hemoglobin concentration was categorized as improvement.

Data were collected through structured questionnaires, clinical observations, and laboratory examinations (Suyanto & Salamah, 2018). Primary data included demographic identity, anthropometric measures (weight, height, body mass index), menstrual cycle information, and hemoglobin levels, while secondary data were obtained from school and health service records (Suyanto & Salamah, 2018). Daily compliance with product consumption was monitored using observation checklists.

The collected data were processed through editing, coding, scoring, tabulation, and computerized entry (Sugiyono, 2022). Statistical analyses were performed using SPSS. Univariate analysis was used to describe the demographic and clinical characteristics of respondents (Sekaran & Bougie, 2016). The Kolmogorov–Smirnov test was applied to assess normality of the data distribution. For normally distributed data, a paired t-test was used to compare pre-test and post-test hemoglobin levels; otherwise, the Wilcoxon signed-rank test was applied (Sugiyono, 2022).

The research procedure was carried out in three phases. The preparation phase included obtaining ethical clearance, preparing raw materials and product packaging, and training enumerators. The implementation phase involved socialization of the study, screening and selection of respondents, baseline measurement of hemoglobin and other variables, administration of the intervention product, and daily monitoring of compliance. The evaluation phase consisted of post-test hemoglobin measurement, data processing, analysis, and reporting.

RESULTS AND DISCUSSIONS

Results

The findings of this study revealed a significant improvement in hemoglobin (Hb) levels among female adolescents with anemia after the intervention using soft candy formulated with beetroot, carrot, and broccoli (Eve 3 Bibote). Table 1 presents the descriptive statistics of Hb levels before and after the intervention. At baseline (pretest), the lowest Hb level was 9.29 g/dL and the highest was 13.48 g/dL, with a mean of 11.21 g/dL. After the intervention (posttest), Hb levels increased, with the lowest value being 11.29 g/dL and the highest reaching 15.48 g/dL, resulting in a mean of 13.21 g/dL.

Table 1. Hemoglobin (Hb) levels before and after intervention

Variable	Pretest			Posttest		
	Lowest Value	Highest Value	Mean	Lowest Value	Highest Value	Mean
Hb (g/dL)	9.29	13.48	11.21	11.29	15.48	13.21

Further analysis of the frequency distribution confirmed that all respondents (n = 88, 100%) experienced improvement in Hb levels after the intervention, with no participants remaining in the "no improvement" category. This suggests that the intervention was effective in enhancing hemoglobin status across the entire sample population.

Table 2. Frequency distribution of Hb improvement among respondents

Hb Status	n	%
Improved	88	100
Not improved	0	0
Total	88	100

The statistical test results presented in Table 3 further highlight the effectiveness of the intervention. Using the Wilcoxon signed-rank test, the mean Hb levels increased significantly from 11.21 g/dL before intervention to 13.21 g/dL afterward, both with a standard deviation of 0.722. The p-value was 0.000 ($p < 0.05$), indicating a statistically significant effect of the soft candy intervention on Hb levels among female adolescents with anemia.

Table 3. Effect of Eve 3 Bibote on Hb levels

Variable	Mean	Std. Deviation	p-value
Pretest	11.21	0.722	0.000
Posttest	13.21	0.722	

Normality testing using the Kolmogorov-Smirnov test revealed that both pretest and posttest data were not normally distributed, with a significance value of 0.044 ($p < 0.05$). Therefore, non-parametric analysis was considered appropriate for hypothesis testing.

Table 4. Normality test results (Kolmogorov-Smirnov)

Variable	Category	Sig.
Hb	Pretest	0.044
Hb	Posttest	0.044

Discussion

The results of this study demonstrate that Hb levels in female adolescents improved significantly after receiving the Eve 3 Bibote soft candy intervention. The increase from an average of 11.21 g/dL before intervention to 13.21 g/dL afterward (an increase of 2 g/dL) suggests that this product could serve as a functional food supplement to address anemia among adolescents. This finding is consistent with the theoretical understanding that adolescent girls are particularly vulnerable to anemia due to rapid growth, monthly menstrual blood loss, and unbalanced dietary patterns (Hidayati et al., 2025; Labcito, 2025). Nutrient-rich foods such as beetroot, broccoli, and carrot provide essential components for

erythropoiesis. Beetroot is a source of iron and folate, broccoli contains vitamin C that enhances non-heme iron absorption, and carrot provides beta-carotene and antioxidants that support iron metabolism and red blood cell formation (Paramitha et al., 2024; Utami & Farida, 2022).

The study findings are in line with previous research showing that beetroot juice significantly increases Hb levels in anemic adolescent girls (Pratiwi & Sofiana, 2019). Similarly, Astuti et al. (2019) reported that consumption of green vegetables such as broccoli, which are rich in iron and folate, contributes to higher hemoglobin levels. Aulia et al. (2017) and Novianti (2009) also noted that carrot, in addition to its antioxidant properties, supports the iron metabolism required for erythropoiesis. The observed synergistic effect of combining these three ingredients aligns with WHO (2020) recommendations that encourage local food-based interventions rich in iron and micronutrients as part of strategies to reduce anemia prevalence in developing countries (Amoakoah Twum et al., 2021; Prisanti et al., 2024).

The candy format may also have influenced the effectiveness of the intervention. Compared to traditional iron supplements such as Fe tablets, which often cause gastrointestinal side effects and reduce compliance, soft candy is more palatable and better accepted by adolescents. This higher compliance could explain the uniform improvement observed in all study participants.

Despite these promising results, several limitations must be acknowledged. Laboratory analysis revealed that the nutritional content of Eve 3 Bibote was not as high as standard government-provided iron supplements (TTD). Therefore, while effective as a complementary supplement, the product cannot yet serve as a substitute for standardized therapy. Additionally, the study experienced delays due to extended laboratory testing (up to 25 days), which constrained the research timeline. Future studies with longer intervention periods and larger samples are recommended to validate these findings and to optimize the formulation of the product.

In conclusion, the intervention using soft candy made from beetroot, broccoli, and carrot (Eve 3 Bibote) effectively improved Hb levels in female adolescents with anemia. The product demonstrates potential as an innovative, functional, and locally sourced nutritional supplement to complement existing anemia prevention programs in Indonesia.

CONCLUSIONS

This study demonstrated that the consumption of soft candies made from a combination of beetroot, broccoli, and carrot (Eve 3 Bibote) significantly improved hemoglobin (Hb) levels among adolescent girls with anemia at SMKN 1 Gunung Putri Cikeas, Bogor Regency, with an average increase of 2 g/dL. These findings contribute to the body of literature on food-based interventions by highlighting that an innovative functional confectionery product can serve as an effective, safe, and more acceptable complementary alternative for adolescents compared to conventional iron supplementation. The implications of this research reinforce the importance of developing anemia prevention strategies utilizing local food sources rich in iron, folate, vitamin C, and antioxidants, while also promoting nutrition education programs within schools. Nevertheless, this study has several limitations, including the nutritional content of the product not being fully equivalent to the government's standard supplementation, the absence of a control group, and the limited study duration that constrained long-term monitoring. Therefore, future studies are recommended to involve larger and more diverse samples, employ randomized controlled trial designs, and further explore the long-term effects of Eve 3 Bibote on the hemoglobin status of adolescent girls. Overall, this study successfully addresses the research question by confirming that Eve 3 Bibote has the potential to be a locally based, innovative nutritional intervention that supports government efforts to reduce the prevalence of anemia among adolescent girls in Indonesia.

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