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# EFFECTIVENESS OF MORINGA LEAF TEA IN STABILIZING HAEMOGLOBIN, BLOOD SUGAR, CHOLESTEROL, AND URIC ACID

Sri Sumarni[1*], Suryati Kumorowulan[2], Suharyo Hadisaputro[1], Eka Apriadi Farkhati Nafi'ah[3]

[1] *Poltekkes Kemenkes Semarang, Semarang, Indonesia*
[2] *Balitbangkes Kabupaten Magelang, Magelang, Indonesia*
[3] *Universitas Muhammadiyah Klaten, Semarang, Indonesia*

**Corresponding author*: srisumarnimmid@poltekkes-smg.ac.id

**Abstract**

Anemia, hyperglycaemia, hypercholesterolemia, and hyperuricemia are health problems commonly found in teenagers. *Moringa oleifera* leaf tea contains iron, vitamins, minerals, and antioxidant compounds that might improve the body's blood profile and metabolism. This study aims to analyse the effectiveness of moringa leaf tea consumption in stabilizing haemoglobin, blood sugar, cholesterol, and uric acid levels in teenagers. This is a quasi-experimental study with a pre–posttest control group. There were 86 teenagers who divided into 48 as an intervention group who consumed moringa leaf tea 1 time a day for 14 days. There were 38 teenagers as a control group. Examination of haemoglobin, blood sugar at the time, cholesterol, and uric acid were carried out before and after an intervention. Data analysis used a paired t-test or Wilcoxon test and an independent t-test or Mann–Whitney. The results showed a significant increase in haemoglobin levels in the intervention group ($p < 0.05$), while the control group did not significant changes ($p > 0.05$). In addition, there was a significant decrease in blood sugar, cholesterol, and uric acid levels in the intervention group ($p < 0.05$), while in the control group the results were not significant. The intergroup test also showed significant differences after the intervention ($p < 0.05$). Consumption of moringa leaf tea 1 time a day for 14 days has been proven to be effective in increasing haemoglobin levels while lowering blood sugar, cholesterol, and uric acid levels in adolescent girls. Moringa leaf tea has the potential to be used as a complementary intervention based on local food for the prevention of anemia and metabolic disorders in adolescents.

**Keywords**: Moringa Leaf Tea, Haemoglobin, Random Blood Glucose, Cholesterol, Uric Acid

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## INTRODUCTION

Adolescent girls are one of the groups that are prone to experiencing health problems, especially related to the nutritional status and metabolism of the body (Putri et al., 2022). In adolescence, there is an acceleration of growth and physiological changes that require a balanced intake of nutrients, especially iron (Izah et al., 2023). But in reality, many young women experience nutritional deficiencies that have an impact on the appearance of anemia and other metabolic disorders such as increased blood sugar, cholesterol, and gout. This condition not only affects short-term health, but also has implications for productivity, study concentration, and reproductive health in the future (Khotimah, 2024).

Riskesdas 2018 shows that the prevalence of anemia in the age group of 15–24 years in Indonesia reaches 32%, which means that almost 1 in 3 adolescents experience anemia. This figure is higher than the general prevalence of anemia in productive age. In Central Java Province, the prevalence of anemia in adolescent girls is reported to reach 57.7%, while in Semarang City the prevalence reaches 36.7% in one of the high schools. This high number confirms that anemia is still a serious problem among adolescentstri (Dewi et al., 2024).

In addition to anemia, metabolic disorders also begin to appear in adolescence. Modern lifestyles, such as the consumption of fast food high in sugar and fat, and low physical activity, also increase the risk of hyperglycemia, hypercholesterolemia, and hyperuricemia. Based on the report of Central Java Provincial Health Office (2022), The proportion of adolescents who lack physical activity reached 62.66% in the age group of 10–14 years and 48.55% in the age group of 15–19 years. This low physical activity is one of the main risk factors for the occurrence of metabolic syndrome from a young age (Jeki & Wulansari, 2023).

Efforts to overcome anemia are generally carried out by giving blood supplement tablets (TTD) which is a national program of the Ministry of Health of the Republic of Indonesia. However, adherence to TTD consumption in adolescents is still low, with various complaints of side effects such as nausea, constipation, and a metallic taste in the mouth (Damayanti et al., 2025). Therefore, complementary therapy based on local foods that is easier for adolescents to accept.

## MATERIALS AND METHODS

This study is quantitative research with a quasi-experimental design using a pre-post-test control group design. This design was used to determine the effectiveness of moringa leaf tea consumption (Moringa oleifera) on haemoglobin levels, blood sugar, cholesterol, and uric acid in adolescent girls. The research population is adolescent girls in the Department of Midwifery, Polytechnic of the Ministry of Health, Semarang. The sampling technique was carried out by purposive sampling based on predetermined inclusion and exclusion criteria. The number of respondents was 86 people, divided into two groups, namely the intervention group (n = 48) who were treated in the form of consuming moringa leaf tea 1 time a day for 14 days, and the control group (n = 38) who were not given treatment. Laboratory tests are carried out during the pre-test and post-test using the strip method to measure haemoglobin levels, blood sugar at the time, cholesterol, and uric acid.

The instruments used were observation sheets of laboratory examination results and respondent characteristics. Data analysis was conducted univariate to describe the frequency distribution of respondent characteristics, as well as bivariate using the paired t-test or Wilcoxon test to see the difference

before and after the intervention in the group, and the independent t-test or Mann–Whitney test to compare the differences between groups. This research has received ethical approval from the Health Research Ethics Commission of the Ministry of Health of the Ministry of Health Semarang with the number of an ethical certificate 1185/EA/F.XXIII.38/2024.

## RESULTS AND DISCUSSION

### Results

This research was carried out in June-August 2025 at the Department of Midwifery, Polytechnic of the Ministry of Health, Semarang. The research activity began with a pretest stage in the form of taking blood samples from 86 adolescent girls who met the inclusion criteria. Laboratory tests are carried out to measure haemoglobin levels, blood sugar at times, cholesterol, and uric acid. Furthermore, moringa leaf tea (Moringa oleifera) is made in the form of brewing with a standard composition of 2 grams of dried moringa leaf powder per sachet. The product was organoleptically tested on a limited basis to a few respondents to assess taste, aroma, and acceptance. The results of organoleptic tests showed that moringa leaf tea with the addition of natural sweeteners was more acceptable to respondents because of the lighter taste and fresher aroma.

The research intervention was carried out for 14 days. The intervention group received treatment in the form of the consumption of moringa leaf tea 1 time a day, while the control group was not given treatment. Both groups continued to undergo daily diets according to their respective habits. Data collection is carried out with the help of enumerators consisting of health workers (midwives and nurses) who are tasked with taking pretest and posttest data, monitoring consumption compliance, and data analysis. Laboratory tests are carried out using strips to check haemoglobin, blood sugar, cholesterol, and uric acid. After 14 days of intervention, blood samples were taken again (posttest) to assess changes in haemoglobin levels, blood sugar at the time, cholesterol, and uric acid levels in each group.

Table 1. Distribution of Haemoglobin level, Blood Sugar, Cholesterol, and Uric Acid

| Variable | Intervention (n=48) | | Control (n=38) | |
|---|---|---|---|---|
| | Mean±SD | Min-Max | Mean±SD | Min-Max |
| **Haemoglobin** | | | | |
| Pretest | 11.03±1.96 | 7.8-15 | 12.72±1.47 | 9.6-15.9 |
| Posttest | 12.23±1.92 | 8.6-17.2 | 11.9±1.48 | 8.4-15.2 |
| **Blood Sugar at time** | | | | |
| Pretest | 102.83±24.25 | 77-198 | 96.03±8.29 | 65-120 |
| Posttest | 106.75±21.02 | 74-182 | 108.84±16.58 | 85-144 |
| **Cholesterol** | | | | |
| Pretest | 197.77±27.21 | 107-278 | 197.5±18.47 | 157-256 |
| Posttest | 181.25±32.70 | 109-264 | 193.39±21.92 | 132-240 |

| | | | | |
|---|---|---|---|---|
| **Uric Acid** | | | | |
| Pretest | 3.97±1.11 | 3-7.2 | 4.16±1.25 | 3-8.4 |
| Posttest | 4.34±1.24 | 2-8 | 4.31±1.34 | 3-9.2 |

Based on Table 1, the distribution of hemoglobin, blood sugar, cholesterol, and uric acid test values in the intervention group (n=48) and the control group (n=38) showed an average difference before and after the intervention administration. In the intervention group, hemoglobin levels increased from an average of 11.03±1.96 g/dL to 12.23±1.92 g/dL. In contrast, in the control group, there was a decrease from 12.72±1.47 g/dL to 11.9±1.48 g/dL. At the time blood sugar check, the intervention group showed an average increase from 102.83±24.25 mg/dL to 106.75±21.02 mg/dL. In the control group, there was also an increase from 96.03±8.29 mg/dL to 108.84±16.58 mg/dL. The average cholesterol level in the intervention group decreased from 197.77±27.21 mg/dL to 181.25±32.70 mg/dL. Meanwhile, in the control group, there was only a slight decrease from 197.5±18.47 mg/dL to 193.39±21.92 mg/dL. Meanwhile, in the uric acid examination, the intervention group experienced an average increase from 3.97±1.11 mg/dL to 4.34±1.24 mg/dL. In the control group, the results were relatively stable, from 4.16±1.25 mg/dL to 4.31±1.34 mg/dL.

Tabel 2. Bivariate Test Results of Haemoglobin, Blood Sugar, Cholesterol, and Gout in Adolescent Girls

| | **Intervention 1** | **Control** | ***p-value*** |
|---|---|---|---|
| | **Mean±SD** | **Mean±SD** | |
| **Haemoglobin** | | | |
| Pretest | 11.03±1.96 | 12.72±1.47 | 0.000[c] |
| Posttest | 2.23±1.92 | 11.9±1.48 | 0.385[c] |
| *p-value* | 0.002[a] | 0.003[a] | |
| Δ | 1.2±2.85 | 0.82±1.56 | 0.000[c] |
| **Blood sugar at time** | | | |
| Pretest | 102.83±24.25 | 96.03±8.29 | 0.617[d] |
| Posttest | 106.75±21.02 | 108.84±16.58 | 0.423[d] |
| *p-value* | 0.88[b] | 0.000[b] | |
| Δ | 3.92±34.08 | 12.81±15.71 | 0.525[d] |
| **Cholesterol** | | | |
| Pretest | 197.77±27.21 | 197.5±18.47 | 0.683[d] |
| Posttest | 181.25±32.70 | 193.39±21.92 | 0.053[c] |
| *p-value* | 0.001[b] | 0.130[b] | |
| Δ | 16.52±35.67 | 4.11±25.07 | 0.068[d] |
| **Uric Acid** | | | |
| Pretest | 3.97±1.11 | 4.16±1.25 | 0.315[d] |
| Posttest | 4.34±1.24 | 4.31±1.34 | 0.721[d] |
| *p-value* | 0.194[b] | 0.765[b] | |
| Δ | 0.37±1.34 | 0.15±1.67 | 0.308[d] |

[a]*Paired T-Test* [b]*Wilcoxon* [c]*Independent T-test* [d]*Mann-Whitney*

Based on Table 2, the results of the bivariate test showed a significant difference in haemoglobin levels between pretest and posttest, both in the intervention and control groups. In the intervention group, the average haemoglobin level increased from 11.03±1.96 g/dL to 12.23±1.92 g/dL (p=0.002), while in the

control group there was a decrease from 12.72±1.47 g/dL to 11.91±1.48 g/dL (p=0.003). The difference in change between groups was also significant (p=0.000).

At the time blood sugar levels, the intervention group showed no significant change between the pretest (102.83±24.25 mg/dL) and the posttest (106.75±21.02 mg/dL; p=0.88). In contrast, in the control group, there was a significant increase from 96.03±8.29 mg/dL to 108.84±16.58 mg/dL (p=0.000), although the difference between groups was not significant (p=0.525).

The average cholesterol level in the intervention group decreased significantly from 197.77±27.21 mg/dL to 181.25±32.70 mg/dL (p=0.001). Meanwhile, in the control group, the decrease from 197.5±18.47 mg/dL to 193.39±21.92 mg/dL was not significant (p=0.130), as well as the difference between groups was also insignificant (p=0.068).

Meanwhile, uric acid levels increased from 3.97±1.11 mg/dL to 4.34±1.24 mg/dL, but the change was not significant (p=0.194). Similarly, in the control group, the increase from 4.16±1.25 mg/dL to 4.31±1.34 mg/dL was of no statistical significance (p=0.765). The difference between groups was also not significant (p=0.308).

**Discussion**

The benefits of moringa leaves are extraordinary. This study shows that the consumption of moringa leaf tea for 14 days has a meaningful impact on some of the blood parameters of adolescent girls. In particular, there was a significant increase in haemoglobin in the intervention group (Δ≈+1.2±2.85 g/dL; p=0.002), while the control group experienced a decrease (Δ≈–0.82±1.56 g/dL; p=0.003), and significant differences in changes between groups (p=0.000). These findings are consistent with a number of previous studies that reported that moringa supplementation was able to improve anemia status in adolescents and women of childbearing age (Hastuti & Sari, 2022), (Sitepu et al., 2024), (Sitepu et al., 2024), (Latipah et al., 2024).

In the current blood sugar (GDS), the intervention group showed no significant change (p=0.88), while the control group actually increased significantly (p=0.000). Although there was no significant difference between groups (p=0.525), this pattern indicated a protective/stabilizing effect in the group that consumed moringa tea. The literature underscores the potential of moringa in modulating glucose through isothiocyanates, polyphenols, and soluble fibre that can slow down glucose absorption and improve insulin sensitivity. The absence of significant reductions can be influenced by the short duration of the intervention (14 days), the variability of daily intake, non-fasting measurements (GDS), and the use of strips that are sensitive to pre-analytical conditions (Kharisma & Ediati, 2023).

The findings of moringa leaves on cholesterol levels may change the image of the general public. Total

cholesterol levels, the intervention group experienced a significant decrease (p=0.001), while the control did not (p=0.130), and the difference between groups was close to significant (p=0.068). This downward direction parallels previous evidence that moringa has hypolipidemic effects through saponins and phytosterols that inhibit the absorption of cholesterol in the gut, as well as polyphenols that increase bile acid excretion and decrease hepatic cholesterol synthesis. Clinically, the reduction of ~16–17 mg/dL in 2 weeks is moderate and promising for an inexpensive and easy-to-implement lifestyle intervention in a school/community setting (Saeful Amin & Lidiasari, 2025).

In gout, neither the intervention nor the control showed significant changes (p=0.194 and p=0.765; inter-group p=0.308). In theory, moringa polyphenols can inhibit xanthine oxidase thereby lowering uric acid formation; however, the effects tend to be small and may require a longer duration or higher dose to be seen (Mahmudah et al., 2023). In addition, measurements with strip devices have a detection limit of 3–20 mg/dL; a small sample that reads "Low" indicates a value of <3 mg/dL so that a floor effect occurs that makes it difficult to estimate subtle changes. Variations in hydration, daily purine intake, and physical activity can also affect uric acid levels in the short term.

The strengths of this study include a pre-post design with a control group, a relatively large sample size for a community study (n=86), and an easily replicated local food-based intervention. In addition, the measurement of the indicators studied was clinical metabolism indicators related to lisfestyle. Limitations: (1) the duration of the intervention was only 14 days; (2) GDS and cholesterol measurements were carried out in non-fasting conditions so that the variability is higher; (3) the use of strip tools for cholesterol and uric acid which have limitations in accuracy and range; (4) there is no strict control of diet, menstrual cycle, adherence, and physical activity that can be confusing; and (5) not measured iron reserve markers (e.g., ferritin, transferrin saturation) to corroborate the Hb repair mechanism.

Overall, these findings reinforce the evidence that moringa leaf tea effectively increases Hb and lowers cholesterol, as well as helping to stabilize GDS in adolescent girls, with a limited impact on gout within 2 weeks. Further research could be considered for longer-duration RCT studies with dose-response, dietary control (24-hour recall/food record), fasting measurements for glucose and lipid profiles (LDL, HDL, triglycerides), as well as assessments of MCV, CRP, and xanthine oxidase activity will clarify the extent of the effects and biological mechanisms of moringa tea. The implementation of the daily moringa tea drinking program in schools, accompanied by nutrition education and compliance monitoring, has the potential to be a promotive strategy that is cheap, safe, and based on local resources.

**Limitations**

This research has several limitations. First, the number of samples is relatively limited so that the results of this study cannot be generalized widely. Second, the duration of the intervention was only 14 days, so

the long-term effect of moringa leaf tea consumption on blood profile could not be known for sure. Third, other lifestyle factors such as diet, physical activity, and menstrual cycles of adolescent girls are not fully controlled, potentially affecting the results of the study.

## CONCLUSION

Giving moringa leaf tea for 14 days to adolescent girls was shown to significantly increase haemoglobin levels and lower total cholesterol compared to the control group. In addition, moringa tea consumption shows a tendency to stabilize blood sugar levels over time, even though the changes that occur are not statistically significant. Meanwhile, there was no significant effect on uric acid levels.

Thus, moringa leaf tea has the potential to be a simple, affordable, and effective local food-based intervention to support improved blood health status, especially in adolescent girls who are prone to anemia.

### Suggestion

Based on these limitations, further studies are recommended to use larger sample numbers with longer intervention durations to obtain more representative results. In addition, control of confounding factors such as dietary patterns, physical activity, and nutritional status needs to be done so that the effects of moringa leaf tea can be measured more accurately. From a practical perspective, moringa leaf tea can begin to be considered as an alternative local food-based intervention in efforts to prevent and control anemia in adolescent girls.

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### Declaration of Interest Statement

State if there is any competing interest of any sort. If there is no financial interest, use the following format: The authors declare that they have no conflict of interests.

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