ORIGINAL ARTICLE

The Effects of Green Beans and Soybean Juice on Haemoglobin (Hb) among Female Adolescents Aged 12-14 Years

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ABSTRACT

Introduction: Green beans (*Vigna radiata*) and soybeans are food sources that contain complete nutrition and micro-nutrients needed by adolescents. A female adolescent with menstruation may experience low haemoglobin. Thus, the purpose of this study was to analyse the effect of green bean and soybean juice on haemoglobin (Hb) among female adolescents aged 12-14 years. **Methods:** It was a quasi-experimental study design. A total of 60 female adolescents were recruited using the purposive sampling technique and divided into two groups. Each group was given green beans and soybeans juice. The length of interventions in each group was fourteen days. Then, we observed the Hb level before and after the intervention. Independent t-test and paired t-test were used for data analysis. **Result:** We found an increase in Hb level after giving green beans juice (11.82 gr/dL) and soybeans juice (11.95%). Data analysis showed a significant difference in each group before and after intervention (<0.001). **Conclusion:** Giving green beans and soybeans juice can be a complementary therapy besides drug therapy to increase Hb levels among female adolescents. Sources of intervention that are cheap and easily available can be a solution to increase Hb levels among female adolescents.

Keywords: Female, Students, Haemoglobin, Adolescent

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INTRODUCTION

Nutritional needs increase in adolescence and will cause nutritional problems. Anemia is a problem of 30% in the world, especially in developing countries. The majority of anemia is experienced by adolescents and pregnant women. Based on data from the Ministry of Health, 22.2% of anemia occurs in adolescents aged 15 years (1), those aged 5-14 years (26.4 %), and those aged 15-24 years (18.4%) (2). Female adolescents are at greater risk of anemia than boys. This is due to menstruation and unhealthy eating habits that cause a lack of micro and macronutrients for the formation of haemoglobin. The condition of decreased Hb for a long time can cause anemia and iron deficiency which has an impact on health (3–5).

Anemia is a condition in which the number of erythrocytes or the concentration of Hb has decreased. This can be caused by a lack of nutrients such as zinc, protein, pyridoxine, ascorbic acid, and alpha-tocopherol which play a role in the formation of erythrocytes (6). According to the World Health Organization (WHO), zinc deficiency can cause anemia by 50-80% (7). Iron deficiency caused a decrease in learning concentration, body resistance to infectious diseases, reduced body health, growth disorders, pregnancy disorders such as bleeding during childbirth, resulting in maternal and infant mortality (8).

Management of anemia can be done through pharmacology and non-pharmacological therapy. Pharmacology therapy by giving zinc tablets and non-pharmacological therapy by consuming fruits and vegetables with high iron content such as green beans and soybeans (9). The process of formation of erythrocytes requires substances and minerals, and some of these substances are found in green beans which play an important role in the process of haematopoiesis (10,11). Another protein and essential amino acid are produced in soybeans. Mineral content such as calcium, phosphorus, and iron in soybeans play a role in the body's metabolism (8,12).

A previous study in Indonesia found that given green bean drinks was able to increase haemoglobin levels in adolescent girls (13,14) and giving soybean affects haemoglobin and erythrocyte levels in white rats (11). However, the combination of both green beans and soybeans have not implemented in the previous study. Thus, the aim of the study was to analyse the effect of green bean and soybean juice on haemoglobin (Hb) among female adolescents aged 12-14 years.

MATERIALS AND METHODS

Study design

A quasi-experimental study design was undertaken from July to September 2019.

Participant and setting

The study was conducted at one of the Junior High Schools in Gorontalo, Indonesia. Respondents were female students in grades VII and VIII. The total population was 210 students, and 66 female students were recruited using the purposive sampling technique. The inclusion criteria were students with a Hb level of <12 gr/dL, not in menstruation circle, and not consuming multivitamins such as zinc tablets. Respondents who cannot follow the study process were excluded. However, six students in both groups were excluded because they were sick and got menstruation. Thus, the total sample was sixty respondents.

Procedure

In this study, we divided respondents into two groups, namely group 1 and group 2. Group 1 was given an intervention by green beans juice and group 2 was given soybeans juice. Both of group was given 250 ml of green beans or soybeans juice depend on the group. Then we gave intervention for two weeks. Green beans and soybeans juice are made by the researcher and distributed by the team. We made the juices as the recommendation of the nutritionist. We observed Hb at the pre and post-test.

Data Analysis

We used paired t-tests to analyze the different pre and post-test interventions of each group. While independent t-test to analyze the difference of each group. The IBM SPSS v.22 was used for data analyses.

Ethical considerations

The study was received approval of ethical clearance from the Health Commission Ethics of Politeknik Kesehatan Kemenkes Gorontalo, Indonesia with the number LB.01.01/KEPK/31.A/2019. Informed consent was given and signed by the author as approval to join the study.

RESULTS

In this study, most of the respondents were aged 13 years (43.4%) and followed by aged 12 years (33.3%). Paired t-test analysis showed there was a significant difference before and after the intervention of green beans juice p=0.001 and there was an increase of Hb level from 9.4-11.55 gr/dL to 10-13 gr/dL. We also found there was a significant difference before and after the intervention of soybeans juice p=0.001 and there was an increase of Hb level from 9.8-11.5 gr/dL to 11-12.4 gr/dL (Table I). Based on the independent t-test, we found that there was no difference in both groups (p=0.601) (Table II).

DISCUSSION

This study provides information about the effect of giving green and soybean juice to 60 female adolescents for 14 days as much as 250 ml per intervention dose. This study tested the effect of increasing Hb levels. From this study, it was found that green bean and soybean juice in each group showed a significant increase in Hb levels. Hb levels are closely related to the condition of anemia. Adolescent girls with menstruation may develop iron deficiency. Every month, during the menstrual cycle, adolescent girls can experience iron deficiency around 12.5-15 mg or 0.4-0.5 mg every day (15). This of course can lead to anemia, which can have an impact on the health condition of adolescent girls (5). Anemia is one of the causes of indirect death in pregnant women (16). The intervention in the form of green bean juice for 14 days was proven to increase the Hb levels of adolescent girls. Hb synthesis takes approximately 7-14 days to become mature and ready to be distributed throughout the body by erythrocytes (17). Green beans also contain 2.19% phytic acid which can inhibit the absorption of minerals such as Ferrum (Fe), Zinc (Zn), and Calcium (Ca). However, the phytic acid level can be reduced through the soaking process (17)to increase protein digestibility

Table I: Paired t test analysis of green beans and soybeans on haemoglobin among female adolescent aged 12-14 years.

Variable	Min	Max	mean±SD (gr/dL)	Delta	*p*	95%CI	
						Lower	Upper
Green beans juice							
Hb before	9.4	11.5	10.49±0.55	1.33±0.40	0.001	1.088	1.578
Hb after	10	13	11.82±0.72				
Soybeans juice							
Hb before	9.8	11.5	10.53±0.60	1.42±0.62	0.001	1.188	1.651
Hb after	11	12.4	11.95±0.56				

Hb: Hemoglobin; SD: standard deviation; CI: confident interval

Table II: Independent t test analysis of green beans and soybeans on haemoglobin among female adolescent aged 12-14 years.

Group	Mean	SD	delta	Mean	*p*	95% CI	
						Lower	Upper
Hb level							
Green beans juice	11.82	0.72	1.33± 0.40	0.0867	0.601	0.243	0.417
Soybeans juice	11.95	0.56	1.42± 0.62				

Hb: Hemoglobin; SD: standard deviation; CI: confident interval

in the body (12). Previous research conducted in Indonesia, it is known that giving mung bean food is proven to increase the number of Hb (13,19–22). The increase in Hb levels is due to the iron content that is needed to form blood cells. In addition, green beans also contain vitamin C which is very good for helping the absorption of iron in the body (9,23). Another study shows that there were significant differences in Hb levels of students before and after consuming bananas (24).

Not only that but from this study, it is also known that giving green bean juice can also increase Hb levels in female adolescents. Soybeans have a higher iron content of 8.0 mg compared to 6.7 mg of green beans, which is a substance that is needed by the body, especially for the formation of erythrocytes (23,24). A previous study conducted in Indonesia also stated that the results of giving soybean juice or drink were proven to increase Hb levels in the blood (27–29).

Sources of protein that contain a lot of iron such as green beans and soybeans are very numerous and easily available in Indonesia. Dissemination of information about the importance of protein intake for adolescent girls is very important. This can have an impact on changing behavior to consume nutritious food and drinks if it starts with intentions and desires (30). The results of this study can provide additional sources of information about the importance of maintaining Hb levels and information regarding interventions to increase Hb levels in female adolescents. The limitation of this study is that the researchers only looked at the effectiveness of each intervention. It is hoped that in the future there will be research that adds an intervention group of green beans and soybeans.

CONCLUSION

From this study, it can be seen that giving green bean and soybean juice for 14 days with a dose of 250 ml each can increase Hb levels in female adolescents. This can be used as a complementary non-pharmacological therapy. Not only that, the easy availability of green beans and soybeans in Indonesia can be used as a solution to increase Hb levels. In addition, providing information about the importance of good nutritional intake needs to be done to prevent anemia or other diseases.

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