Research article **Medical research**

Potential of seed leaves (psidii folium) extracts as alternative materials on changes in hemoglobin and ferritin levels in youth teenage

(Case study in bakhti nusantara vocational school)

Angela Ditauli Lubis[1*], Supriyana[2*], Runjati[2]

[1]*Poltekkes Kemenkes Semarang / Semarang, Indonesia*
[2]*Poltekkes Kemenkes Semarang / Semarang, Indonesia*
[3]*Poltekkes Kemenkes Semarang / Semarang, Indonesia*

*Corresponding author: Angela DitauliLubis
Email: angela.lubis03@gmail.com

ABSTRACT

Background

Anemia is a health problem throughout the world, especially in developing countries. The incidence of anemia in adolescent girls is 57.1%. Management of anemia was carried out by administering Fe tablets, but Fe tablets had side effects, namely defecation and nausea, which led to reduced compliance with drug consumption. One alternative to preventing anemia is to use guava leaf extract which can reduce nausea side effects and contain antioxidants for the body and blood profile levels.

Objective

To prove the influence of guava leaf extract on changes in hemoglobin levels and ferritin levels
Research Methods: The type of research method used is True Experiment. The research design used was pretest and post-test control group design. With a sample of 30 female adolescents divided into 2 groups, namely the control group given Fe 60 mg and the intervention group gave Fe 60 mg and guava leaf extract 500 mg. Data analysis using Wilcoxon and Independent T-Test

Results

After the intervention was given p-value = 0.027 (<0.005) means that there were differences in hemoglobin values after being given treatment in both groups. The mean mean ferritin of the treatment group> Control group (24.33 ng / dl> 10.48 ng / dl), p-value = 0,000 (<0.005) means that there are differences in ferritin values after treatment in both groups.

Conclusion

Guava leaf extract has an effect on increasing hemoglobin levels and ferritin levels.
Suggestion. Guava leaf extract can be used as an alternative therapy for increased hemoglobin and ferritin levels

Keywords: Guava leaf extract, Hemoglobin, Ferritin

INTRODUCTION

Anemia is one of the health problems throughout the world, especially developing countries, which is estimated to be 30% of the world's population suffering from anemia 1. Anemia occurs a lot in society, especially in adolescents and pregnant women. Anemia in young women is still quite high to date [1].

According to the Riskesdasdata the anemia prevalence in Indonesia is 21.7%, with anemia sufferers aged 5-14 years 26.4% and 18.4% sufferers aged 15-24 years [2]. Data on Household Health Survey (SKRT) in 2012 stated that the prevalence of anemia in adolescent girls aged 10-18 in 2012 was 57.1% and ages 19-45 were 39.5% [3]. Women had the highest risk of anemia, especially in young women [4].

There are many types of anemia, but the most common is iron deficiency anemia, which is anemia caused by iron deficiency which is the main ingredient in the formation of hemoglobin, resulting in impaired hemoglobin synthesis which ultimately causes a decrease in oxygen transport in the blood [5]. Iron deficiency anemia is considered a factor the most important in increasing the burden of disease throughout the world, generally occurs in childhood and pregnant women [6].

Young women have a higher risk of anemia than young men. First, because every month young women experience menstruation. A woman who has a lot of menstruation for more than five days is feared to lose iron, so she needs more replacement iron than women who have only three days and a little. Second is because young women often maintain their appearance, the desire to stay slim or thin so they diet and reduce eating. A diet that is not balanced with the body's nutritional needs will cause the body to lack important nutrients such as iron [7].

In general there are several factors that cause anemia, namely chronic blood loss or a lot of menstrual blood, menstrual periods, insufficient iron intake, inadequate absorption and increased iron requirements, nutritional status, malaria, other infections, and knowledge about anemia [7]. The factor of duration of menstruation and nutritional status is a factor that is strongly associated with anemia. Normally, every day a woman will lose about 1-2 mg of iron through normal excretion [7].

In the human body, the amount of iron varies greatly depending on age, sex, and physiological condition of the body [8]. In healthy adults, the amount of iron estimated at more than 4000 mg with around 2500 mg is in hemoglobin [8]. Part of iron in the body (about 1000 mg) stored in the liver in the form of ferritin. When iron consumption from food is insufficient, ferritin iron is released to produce hemoglobin [8]. When the body does not produce iron from food because of the consumption of less iron-containing foods, iron reserves of ferritin are used continuously, so that the reserve of substances iron is used up, this can cause anemia. Less micro and macro nutrients cause the body to be thin and lose weight drastically, short, anemia, persistent pain, so as a prospective mother is not health [8].

According to Prawirohardjo stated that prevention of anemia, namely every teenager given sulfasferrousgluconateferrous, is only 1 tablet a day. Teenagers are encouraged to eat more protein and vegetables that contain lots of minerals and vitamins. Sometimes tablets add blood to cause unpleasant feelings such as abdominal pain, discomfort, nausea, difficulty defecating, black stools, this is because the iron content is high which is 200mg or 60mg elemental and 0.25mg folic acid, this causes people to tend to disobey consume iron tablets [8].

As one alternative that can be used to increase blood profile levels is by using guava leaves (Psidii folium). Guava leaves are easily available because they can grow in various regions in Indonesia. Guava leaves are easier to obtain compared to guava fruit, this is because the leaves are easier to find without having to wait for the flowers to bear fruit. Guava leaves contain essential oils, tannins, saponins, terpenoids, flavonoids, anthocyanins and alkaloids [9]. According to several studies in the journal FMIPA UI in 2011, guava leaves have been shown to have various pharmacological effects, including analgesics, anti-inflammatory, antiviral and antitumor, antidiarrheal, anti-bacterial, anti-dental, antidiabetic, antihypertensive, hepatoprotective, and antioxidant [11].

Flavonoid content in guava leaf extract has antioxidant activity that works as a free radical catcher can certainly be used to repair or restore blood vessel endothelial function [10]. Vascular endothelial cells are layers of flat cells that line the surface of blood vessels and are directly related to blood and products other blood flowing in it.

Antioxidants in flavonoids can donate hydrogen atoms. Flavonoids will be oxidized and bind to free radicals so that free radicals become more stable compounds [12]. Phytochemical analysis by Arya in 2012 stated that guava leaf extract has antioxidant compound activity, one of which is flavonoid compounds, because of its ability to reduce free radicals or the ability to reduce oxidation number in the blood.

Based on the description above, the researcher was interested in conducting a study on the effect of guava leaf extract (PsidiiFolidum) on changes in blood profile levels in adolescent girls at Bahkti Nusantara Vocational School.

Study Objectives

To prove the influence of guava leaf extract on changes in hemoglobin levels and ferritin levels

METHODS

This research is a True experiment with pretest and posttest control group design. The number of samples 30 was divided into 2 groups of 15 samples in the control group and 15 samples in the treatment group. Inclusion criteria for female adolescents aged 15-18 years, initial hemoglobin levels from 10 to 11.9 gr/dl. The variables studied were ferritin levels and blood hemoglobin levels before and after treatment. Conducted guava leaf extract for 14 days. The measuring instruments used were questionnaires, digital Hb gauges, Ferritin level examinations carried out at the UndipTembalang GAKY Lab

Data Analysis

Data analysis was performed, namely Univariate Analysis, carried out to analyze descriptively the research variables by testing the normality of the data. Descriptive analysis is performed to describe each variable examined separately by making a mean table. Median, standard deviation from massing-massing variables. Bivariate analysis, conducted to test each variable between the two control groups and the intervention group, in this research data the data are not normally distributed, then the non parametric test used by the test used is the MannWhitney test on the variable hemoglobin and ferritin levels in pairs, whereas in unpaired variables using the Wilcoxon test.

RESULT

Characteristics of Univariate Respondents

Table 4.1 Characteristics of respondents in the intervention and control groups

Variable	Group		
	Intervention Mean ± SD	Control Mean ± SD	*p-value*
Age	16.40 ± 0.736	15.86 ± 0.639	0.310
IMT	20.33 ± 1.447	20.40 ± 2.557	0.478

Based on table 4.1 it can be concluded that the average age of the study respondents was at the age of 16 years in the intervention group and 15 years for the control group with a p-value> 0.05. BMI data for the intervention and control groups were 20 with a p value> 0.05, which means that for Age and BMI there is no difference.

Description of Hemoglobin Level (Hb)

Table 4.2 Overview of Hemoglobin Levels

Variable of Hemoglobin	Before Mean±SD	After Mean±SD	P value
Intervensi	10.77±0.454	11.47±0.589	0.001*
Kontrol	10.68±0,383	11,11±0.511	0.000**
	Intervensi	Kontrol	
Δ	0.70±0.342	0.42±0.296	0.027***

* Wicoxon ** Paired sampel T-Test *** Independent sampel T-Test

In table 4.2 shows that the results of statistical tests using the Wilcoxon test showed that the mean hemoglobin before and after the intervention group obtained a value $p < 0.05$, it can be concluded that from the first day to the fourteenth day there was a difference between hemoglobin levels before and after treatment. Whereas in the control group Paired T-Test samples were obtained p-value<0.05, it can be concluded that there were significant differences in hemoglobin levels before and after treatment in the control group.

The results of different tests in the unpaired group in the variable hemoglobin level showed the results of statistical tests using Independent Sample T-Test where p-value<0.05 so it can be concluded that there were differences in Hemoglobin levels between the intervention group and the control group after being treated.

Ferritin hormone description

Table 4. 3 Overview of ferritin levels

Variable of Ferritin	Before Mean±SD	After Mean±SD	P value post	P value
Intervensi	24.18±1.552	48.51±2.614	0,015**	0.001*
Kontrol	14.00±2.088	24.88±1.144		0.003*
	Intervensi	Kontrol		
Δ	24.33±1.544	10.48±1.095		0.000**

*Wilcoxon ** Mann Whitney ***Independent T-Test

The table shows that the results of statistical tests using the Wilcoxon test show that the average Ferritin level before and after the intervention group and the control group obtained a value of p-value<0.05, so it can be concluded that from the first day to the fourteenth day there are differences between Ferritin levels before and after treatment.

The results of different tests in the unpaired group in the Ferritin post variable level showed the results of the statistical test using the Mann Whitney test where the p-value was <0.05 so it can be concluded that there were differences in Ferritin post levels between the intervention group and the control group.

The results of different tests in unpaired groups in the Ferritin level variable showed the results of statistical tests using Independent T-Test where p-value<0.05 so it can be concluded that there were differences in Ferritin levels between the intervention group and the control group after being treated.

DISCUSSION

Effect of guava leaf extract on Hemoglobin Levels

To see the difference in hemoglobin levels between the intervention groups who consumed guava leaf extract and the control group that consumed Fe tablets, measurements were taken using the Independent t-test Based on the Independent test results t-test obtained p-value $<\alpha$ (0.05), it can be concluded that administration of guava leaf extract with a dose of 500 mg for 14 days in female adolescents turned out to have a significant effect on changes in hemoglobin levels before being given treatment and after being given treatment.

Guava leaf extract contains flavonoids, flavonoids are polyphenol compounds that act as antioxidants, which in blood cells can act as a reservoir of hydroxyl and superoxide radicals to protect membrane lipids and prevent cell damage. Flavonoid compounds from guava leaf extract can improve the process of erythropoiesis (erythrocyte formation) in the bone marrow and have an immunostimulatory effect [15].

Antioxidants are compounds that fight free radicals and prevent or delay unwanted oxidation or damage to DNA, protein and fat. [16]. Antioxidants can delay or inhibit oxidation reactions caused by free radicals and destroy or neutralize free radicals that can cause damage to cells and molecules. important molecules in the body such as DNA, protein and fat. Antioxidants can only last a few hours in the body because they can dissolve in fat or water. Therefore antioxidants are very necessary for the body [17].

The intake of antioxidant compounds from guava leaf extract, the attack of free radicals on blood cells can be minimized and the process of

forming blood cells can increase so that the hemoglobin level can be maintained. In addition, the results of the Unigwe and Nwakpu studies show that the active ingredients of flavonoids can increase hemoglobin levels [18].

Vitamin C is needed to increase absorption of iron in the body. Addition of vitamin C and Fe can increase Hb levels in young women. Vitamin C has a function in Fe metabolism especially to accelerate the process of absorption of Fe in the intestine and the process of transferring it to the blood. Vitamin C is also involved in mobilizing Fe stores, especially in the formation of hemosiderin in the spleen [19].

Effect of guava leaf extract on ferritin content

From the results of the statistical calculation of Ferritin levels showed that there was a difference in Ferritin levels before and after treatment in the intervention group and the control group. In the intervention group the difference between the average ferritin levels before and after adolescents consumed guava leaf extract namely 24.33 µg / ml with a p-value of 0.008, whereas in the control group the difference in Ferritin levels before and after consuming Fe tablets was 10.48 µg / ml with a p-value of 0.008. It can be concluded that in the intervention and control groups there was an increase.

The results showed that ferritin levels before being given guava leaf extract were still relatively normal, but the hemoglobin level decreased. The serum or plasma concentration of ferritin can reflect the total iron stores in the body when there is no inflammation or infection. Increased serum ferritin levels in individuals can also be used as an indicator of inflammation. The normal category of serum ferritin in girls is 10-120 µg / ml. The value of serum ferritin levels that exceed the maximum upper limit can indicate an iron overload condition. Conversely, serum ferritin levels lower than 10 µg / ml can indicate a decrease in iron stores

Serum ferritin levels will be low in prolonged bleeding conditions, iron deficiency anemia and malnutrition status while inflammatory conditions will increase ferritin levels. Serum ferritin can be affected by levels in a number of clinical settings such as acute liver disease, cirrhosis, Hodgkin's disease, acute leukemia, chronic kidney failure, and solid tumors. This clinical situation can affect the level of false serum ferritin or even in patients with iron-deficiency anemia who should have low serum ferritin levels, but because of the above conditions, it may be that the serum ferritin levels become normal or even increase [21].

The process of iron absorption in the intestine consists of 3 phases, namely the luminal phase, the mucosal phase and the systemic or corporeal phase. In the luminal phase, iron bonds from food ingredients are released/converted into dissolved forms and iron in the form of ferric (Fe 3+) is reduced to Ferro (Fe2 +) so that it is ready to be absorbed by the intestine. In this process gastric sap and stomach acid play an important role. This is related to the number of receptors on the intestinal surface and intestinal pH. 75 In endosome cells the change in pH becomes residual so that partial Ferro release will be stored in ferritin and some will be stored in the lateral basal membrane of duodenal enterocytes. The ferrous ion is then oxidized to Ferro oxidase hephaestin (Hp) to ferric ions to then be bound and carried by transferrin (Tf) in the blood circulation. The released iron is bound and carried by transferrin to cells that need Fe and the rest is stored as ferritin [22].

CONCLUSION

That the consumption of guava leaf extract capsules in young women at the Nusantara Vocational High School can significantly increase hemoglobin levels and Ferritin levels

Recommendation Future

For the next researcher, it is hoped that it can be used as reference material and further research is needed to make guava leaf extract with the addition of flavored aroma without reducing the content of the guava leaf extract

REFERENCES

[1]. World Health Organization. Worldwide Prevalency Of Anemia WHO Global database on Anemia. Geneva WHO Press. 2013.

[2]. KementerianKesehatan RI. LaporanHasilRisetKesehatanDasar (Riskesdas). KementerianKesehatan R I. 2013.

[3]. DepartemenKesehatan RI. Survey KesehatanRumahTangga. Jakarta. 2013.

[4]. KementerianKesehatan RI. ProfilKesehatan Indonesia 2012. KementerianKesehatan RI. 2013.

[5]. Price. A. Sylvia. Wilson. M. PatofisiologiKonsepKlinis Proses Penyakit. Jakarta, EGC. 2005.

[6]. World Health Organization. Worldwide Prevalence of Anemia. WHO. 2008.

[7]. Arisman. GiziDalamDaurKehidupan. Jakarta, EGC. 2004.

[8]. Prawirohardjo, Sarwono. IlmuKandungan. Jakarta, PT. BinaPustakaSarwonoPrawirohardjo. 2009.

[9]. Begum. S, Hasan SI, Siddiqui BS. Two New TriterpenoidsFrom The Fresh Leaves of PsidiumGuajava. Planta Med. 62(12), 2004, 1149-52.

[10]. Li J, Chen F, Luo J. GC-MS Analysis Of Essential Oil From The Leaves Of PsidiumGuajava. Zhong Yao Cai. 22(2), 1999, 78-80.

[11]. Rochmasari, Yuniar. Studi Isolasi dan Penentuan Standar Molekul Senyawa Kimia Dalam Fraksi Netral Daun Jambu Biji Australia (Skripsi). FMIPA UI. 2011.

[12]. Egharevba, H O et.al. Standarization Of Herbal Medicines – A review. International Journal Of Biodiversity and Converzation. 4(3), 2010, 101-112.

[13]. Gutierrez, P.M.P,. Mitchel, S., and Solis, R.V. PsidiumGuajava : a review of its traditional uses, phytochemistry and pharmacology, J. Etnopharmaco. 117(1), 2008, 1-27.

[14]. KementerianKesehatanRepublik Indonesia. PedomanInterpretasi Data Klinik. Jakarta. 2011.

[15]. MiryantiArry. EkstraksiAntioksidan Dari KulitBuahManggis (GarciniaMangostana L). Bandung. 2011.

[16]. EndangPalupi. DegradasiMrthilene Blue DenganMetodeFotokatalisdanFotoelektrokatalisMenggunakan Film TiO$_2$. Bogor,DepartemenFisika IPB. 2009.

[17]. Plank, N. Real Food :HidupBebasPenyakitdenganMakananAlami. Bloomsburry Publishing, New York dan London. 2007.

[18]. Chika UnigwedanNwapku. The Effect of Garcinia Kola Seed Containing Active Ingredients Flavonoids Can Be Increase Hemoglobin (Hb), Erythrocyte and Hematocrit Term Rabbbit. University Of York. 2009.

[19]. Sagung M.D. Pengaruh Pemberian Sirup Besi, Vitamin C Dan Vitamin A Terhadap Kadar Hb Balita Dengan Anemia (Penelitian Eksperimental Di Kabupaten Buleleng). In *Surabaya: Departemen Gizi Kesehatan FKM Unair* (2008).

[20]. Gropper SS. Advance Nutrition And Human Metabolism. In *Amerika Serikat : Wadsworth, Cengage Learning* **Ed 5,** (2009).

[21]. Sumanthi K. Role Of Serum Ferritin In Critically III Patients. In *Int J Pharm Bio Sci* 404–406 (2013).

[22]. Kell DB. Serum Ferritin Is An Important Inflammatory Disease Marker, As It Is Mainly A Leakage Product From Damaged Cells. In *Metallomics* 2013, 748–751.