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PROPOLIS AS AN ALTERNATIVE TO INCREASE HEMOGLOBIN LEVELS IN ANEMIC ADOLESCENT GIRLS

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ABSTRACT

Objective: The purpose of this study was to analyze the effectiveness of *Tetragonula sapiens* propolis collected from North Luwu, Sulawesi, Indonesia to treat anemia in adolescent girls.

Methods: A quasi-experimental design with a two-group pre-test—the post-test design was applied, and 44 respondents were chosen by using purposive sampling. The respondents were divided into two groups. Each group was given iron supplement every day. For the intervention group, the respondents consumed 5 drops of propolis for three times a day. Meanwhile, for the control group, IPI vitamin C was given instead of propolis. The intervention was given for 30 d in a row. The hemoglobin (Hb) level measurement was conducted after 30 d.

Results: The results showed that the Hb levels of the intervention group were higher compared to the control group after propolis was given for 30 d. The result of the analysis showed a significant value of (2-tailed) 0.000<0.05.

Conclusion: *Tetragonula sapiens* propolis could be used to increase the Hb levels in anemic adolescent girl.

Keywords: Adolescent girls, Anemia, Hemoglobin, Propolis, Stingless bee

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INTRODUCTION

Anemia is a condition in which the amount of red blood cells falls below normal. The normal Hb levels in women and men are <12gr/dl and <13.5gr/dl, respectively [1]. It is the second leading cause of disability in the world and is more common in adolescent girls compared to boys. In the former, it is usually caused by loss of iron (Fe) during menstruation, therefore, more intake is needed [2]. In addition, it is caused by a deficiency in iron, vitamin B12, and folic acid, infectious diseases, congenital factors, and bleeding [3].

The World Health Organization (WHO) stated that more than 30% of the world's population has anemia, with a prevalence of 4.3–20% and 30–48% in developed and developing countries, respectively. Globally, it affects 43% of children, 38% of pregnant women, 29% of non-pregnant women, and 29% of women of childbearing age [4]. Based on the 2013 RISKESDAS (Basic Health Research) in Indonesia, anemia in adolescent girls is still quite high, with a value of 18.4%, which increased dramatically to 84.6% in 2018 [5, 6]. In 2017, the prevalence of anemia among adolescent girls in Central Java reached 50% [7]. Meanwhile, in 2019, in Cilacap Regency, it reached 6.75% of the 645 people [8].

Propolis is a product of honeybees that has grown rapidly in recent times. The genus that produces large amounts of this product is *Tetragonula*, which is included in the stingless group of honeybees. One of the species is *Tetragonula sapiens Cockerell* which is found in Sulawesi and Maluku Indonesia [9]. The main components are resins (45-55%), waxes and fatty acids (25-53%), essential oils (10%), proteins (5%), and other organic compounds (5%). In addition, it contains minerals, with iron and calcium being the most

abundant. The resin contains flavonoids that have antibacterial, anti-inflammatory, antioxidant, anticancer, and antiallergic effects [10]. Furthermore, it contains vitamins (A, B1, B2, B6, C, and E) and folic acid to help in the formation of red blood cells [11]. Data in the Sidareja Health Center area in October 2020 showed that from 12 Senior/Vocational High Schools, the highest rate of anemia for adolescent girls was obtained at SMK 18 LPPM RI Sidareja, with a total of 7 out of 15 students. Based on the problems addressed above, researchers have decided to carry out a study titled "Propolis as an Alternative to Increasing Hemoglobin Levels in Anemic Adolescent Girls at SMK LPPM RI Sidareja in 2021".

MATERIALS AND METHODS

This study was carried out using a quasi-experimental design with a pre-test, post-test control group design. Observations were made twice i.e. before and after treatment. The research was carried out on 27 Feb-27 Mar 2021 at SMK 18 LPPM RI Sidareja, Sidareja Sub-district, Cilacap Regency, with a total of 180 respondents. The control group consumed iron supplements and vitamin C every day. As for the intervention group, iron supplement and *Tetragonula sapiens* propolis (under the brand name EZ Propolis) were consumed instead of vitamin C. The ethical approval of this study was granted by Yogyakarta Health Polytechnic (No. e-KEPK/POLKESYO/0224/III/2021). Based on the population above, the sample of 44 respondents was obtained using a non-probability sampling technique with a purposive sampling type. Data collection was carried out using Easy Touch GChb (manufactured by Bioptic Technology Inc., Taiwan), while the analysis was carried out using Paired and Independent Sample T-Tests.

RESULTS AND DISCUSSION

Table 1: Description of Hb levels before and after treatment

	Variable	Min±Max	meant±SD
Hb Levels	Intervention Group		
	Before	0.5±11.9	11.350±0.3726
	After	2.5±15.7	14.223±0.9248
	Control Group		
	Before	0.9±11.9	11.473±0.3011
	After	2.0±14.0	12.864±0.5560

Table 1 shows that the highest Hb levels of the intervention group before treatment was 11.9gr/dl with an average of 11.350. Meanwhile, after treatment, it became 15.7 g/dl with an average of 14.223. In the control group, the highest Hb levels were at 11.9gr/dl before treatment with an average of 11.473. Meanwhile, after the intervention, it became 14.0 g/dl with an average of 12.864.

Iron deficiency anemia is defined as a condition in which the level of Hb falls below the normal range. Anemia often occurs in adolescent girls due to stress, menstruation, diet, and rest [12]. It is also contributed by the bad lifestyle, such as eating snacks with low iron, vitamin, and fiber content. This is because, daily, adolescents tend to consume lots of junk and packaged foods.

Propolis is a substance produced by bees, which consists of a mixture of bee saliva and plant exudates. The main components are

resin (45-55%), wax and fatty acid (25-53%), essential oil (10%), protein (5%), and other organic compounds (5%). The resin contains flavonoids that have antibacterial, anti-inflammatory, antioxidant, anticancer, and antiallergic effects [11].

The study carried out by Nurmalasari (2014) titled "The Differences in the Honey and Propolis Effectiveness on Health Conditions in Toddlers at Mawar VII Integrated Healthcare Center, Sidodadi Village, Kedaton sub-district, Bandar Lampung in 2014", obtained a p value of $0.00 < 0.05$ for the propolis treatment group. This indicates that there is a significant difference between Hb levels before and after propolis administration. The formation of Hb in the bone marrow requires organic and mineral compounds such as Fe, Zn, Au, Ag, Cs, Hg, La, and Sb, including vitamins such as B6, B1, B12, and vitamin C to ripen Hb. Zinc and vitamin A function as a catalyst in accelerating the process of its formation [12].

Table 2: Comparison of Hb levels between the two groups

Variable	N	mean±SD		Sign. (2-tailed)	
		Intervention group	Control group		
Hb Levels	Before	22	11.350±0.3726	11.473±0.3011	0.236*
	After	22	14.223±0.9248	12.864±0.5560	0.000*

*Independent T-Test; Data was presented in mean ± SD, n=22

Table 2 shows the difference in Hb levels before and after treatment between the two groups. The average increase in Hb levels in the intervention and control groups were 2.873 and 1.391, respectively. The results of statistical tests using the independent sample T-test obtained a significant value (2-tailed) of 0.000. This indicates that there is a difference in the average increase in Hb levels between the intervention and the control group.

The etiology of iron deficiency is caused by a negative balance between iron intake and output. The minimal intake of iron-containing foods such as vitamin C contributes to its absorption and metabolism [13].

The iron level in the human body depends on its absorption. Therefore, vitamin C-containing fruit such as oranges, papaya, and certain animal protein such as beef, chicken, and fish, increase its absorption [14].

Vitamin C, which is bound to iron deficiency, helps accelerate iron absorption in the body and transfers it into the blood. Iron mobilization, especially in hemosiderin in the spleen, and vitamin C play a role in transferring iron from transferrin in plasma to ferritin [15].

As much as 25-75 mg of vitamin C increases the absorption of non-heme iron into four times higher [2]. This is in line with the study carried out by Almasury (1998) which states that giving 60 mg iron capsules added with 100 mg vitamin C increases the average iron absorption by 10% [16].

This is also in line with the study carried out by Andaruni (2018) titled "Effectiveness of Iron (Fe), Vitamin C and Guava Juice to Increase Hemoglobin (Hb) Levels of Adolescent Girls at Muhammadiyah University of Mataram". A p value of $0.001 < 0.05$ was obtained, indicating that there is an effect of supplementation of Fe+vitamin C tablets on the Hb levels [17].

CONCLUSION

Based on the results and discussion, there was an increase in Hb levels in anemic adolescent girls at SMK 18 LPPM RI Sidareja in 2021 with a sign value. (2-tailed) 0.000. Hence, propolis is expected to be one of the non-pharmacological methods for adolescent girls to overcome anemia.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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