

## GIVING MORINGA LEAF ESSENCE TO ADD HEMOGLOBIN LEVELS IN FEMALE ADOLESCENTS: SYSTEMATIC REVIEW

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### ABSTRAK : PEMBERIAN ESENSI DAUN KELOR UNTUK MENAMBAH KADAR HEMOGLOBIN PADA REMAJA PEREMPUAN: SYSTEMATIC REVIEW

Latar Belakang: Anemia lebih sering terjadi pada remaja khususnya pada negara berkembang dan kekurangan zat besi merupakan penyebab paling utama yang memengaruhi 50% anemia pada perempuan. Daun kelor mengandung zat gizi makronutrien dan mikronutrien yang tinggi dan dapat meminimalkan risiko anemia.

Tujuan: Mengetahui pengaruh ekstrak daun kelor dalam meningkatkan kadar hemoglobin pada remaja perempuan.

Metode: *Systematic review* dicari menggunakan lima database elektronik (PubMed, ScienceDirect, Willy, EBSCO dan PMC) dan layanan pencarian google scholar. *Systematic review* ini menggunakan PRISMA *checklist* sebagai acuan dan menggunakan *checklist Joanna Briggs Institute (JBI)* untuk menilai kualitas studi. Judul, abstrak, *full text*, dan metodologi dinilai untuk kelayakan studi. Dilakukan tabulasi data dan analisis narasi temuan studi. Ditentukan 9 studi yang memenuhi kriteria untuk dilakukan analisis.

Hasil: Keseluruhan studi menyatakan bahwa ada peningkatan rata-rata kadar hemoglobin setelah diberikan intervensi ekstrak daun kelor, meskipun ada beberapa tidak secara lengkap menjelaskan dosis yang digunakan. Sementara ini belum ada riset mengenai efek samping penggunaan daun kelor.

Kesimpulan: Kesimpulan riset ini terdapat pengaruh ekstrak daun kelor dalam meningkatkan kadar hemoglobin pada remaja perempuan.

Saran: Diharapkan bagi orang tua yang memiliki anak remaja perempuan menyediakan makanan dengan bahan dasar daun kelor untuk memenuhi kebutuhan gizi agar tidak terjadi ataupun mengobati anemia pada remaja perempuan.

Kata Kunci : Daun Kelor, Kadar Hemoglobin, Remaja Perempuan

### ABSTRACT

Background: Anemia is more common in teenagers, especially in underdeveloped countries, and iron deficiency is the leading cause of anemia in women, accounting for half of all cases. Moringa leaves are high in macronutrients and micronutrients, which can help to reduce the risk of anemia.

Purpose: The goal of this study was to see if Moringa leaf extract may help adolescent girls increase their hemoglobin levels.

Methods: Five electronic databases (PubMed, ScienceDirect, Willy, EBSCO, and PMC) and Google Scholar as search engines were applied to find systematic reviews. The PRISMA checklist was used as a guide for this systematic review, and the Joanna Briggs Institute (JBI) checklist was used for assessing the study's quality. The feasibility of the study was affected by reviewing the title, abstract, full text, and methodology. Data tabulation and narrative analysis are needed to analyze the research findings. Nine studies could have answered the criteria for analysis.

Results: Although some studies did not fully explain the dose used, all of them declared an increase in the average hemoglobin level after being given the intervention of Moringa leaf extract. Meanwhile, no research was about the effects of using Moringa leaves.

Conclusion: The study concluded that Moringa leaf extract affects increasing hemoglobin levels in adolescent girls.

Suggestions; Parents of adolescent girls expect to provide food containing the main ingredients of Moringa leaves to fulfill nutritional needs to prevent or treat anemia.

Keywords : Moringa Leaves, Hemoglobin Levels, Adolescent Girls

### INTRODUCTION

Children, adolescent girls, and women of reproductive age are a group at risk of anemia (Balarajan, Ramakrishnan, Özaltin, Shankar, & Subramanian, 2011). Disadvantages of iron deficiency is the reason most main which affects 50% of anemia in women worldwide (Kassebaum, 2016). Anemia is a condition that occurs when the quantity and levels in red blood cells (hemoglobin) are under calculation of a set cut-off (<12g/dl), thereby impairing the capacity of blood to transport oxygen throughout the body (WHO, 2014). Anemia is more common in adolescents, especially in developing countries, and is a health problem in vulnerable communities. This study has been carried out in several developed and developing countries showing the results of the prevalence of anemia in children teenage girls prone to be higher than that of teenage boys (de Andrade Cairo, Silva, Bustani, & Marques, 2014).

According to WHO in the Prevention of Iron Deficiency Anemia in Adolescents shows that 7.5 million young girls in Indonesia suffer from anemia (WHO, 2011). The prevalence of teenage girls aged 10-18 years is as much as 57.1% and aged 19-45 years as much as 39.5% (Kemenkes, 2018). The health impact of anemia among women and children is a concern and a global burden of disease because it has lifelong negative consequences at the developmental stage (Black, 2012; Kassebaum et al., 2014).

This iron deficiency occurs because of the occurrence of inequalities between intake in the body and needs prolonged iron deficiency, inadequate iron intake or absorption, increased iron requirements during pregnancy or growth, and height iron reduction impact from menstruation and worms (intestine) (Balarajan et al., 2011; WHO, 2014). Adolescent girls experience menstruation, so they are at risk for iron deficiency anemia (Lopez, Cacoub, Maccougall, & Peyrin-Biroulet, 2016). Consuming a diet that is not sufficient for needs and concurrent with menstrual disorders or menstruation for the first time is also a factor in anemia. The amount of menstrual blood is also a cause of iron deficiency anemia (de Andrade Cairo et al., 2014).

One of the endeavors The solution to the problem of anemia is by consuming more foods that contain lots of iron. Iron is divided into two types, namely heme and non-heme. Heme iron is easier for the body to absorb than non-heme iron. Heme-type iron is mostly found in animal foods, while non-heme-type iron is more and more found in vegetables (Hurrell & Egli, 2010).

Based on the results of Riskesdas in 2018, from 80.9% of female adolescents who received iron

tablets at school, it was also found that 98.6% of female adolescents consumed less than 52 iron tablets. Meanwhile, female adolescents who consumed blood tablets more than 52 were only 1.4% (Kemenkes, 2018). Based on research conducted by Widiastuti, et al related to adherence to the consumption of blood supplement tablets, it was found that less than 50% of students living in urban areas consumed blood booster pills. Disorders often occur such as nausea, and dislike of the smell and taste. The last effort that is generally done is to maximize the consumption of Foods that contain lots of nutrients that can increase hemoglobin levels (Widiastuti & Rusmini, 2019).

## RESEARCH METHODOLOGY

Reference for formulating research questions using "PICO" (Population, Intervention, Comparator, and Outcome)

Population : Adolescent Girls  
Intervention : *Moringa Oleifera*  
Comparator : There are no comparisons or other interventions  
Outcome : Hemoglobin level

### Search Strategy

The database used as a source of information search from various articles related to the topic uses five database sources, namely PubMed, PMC, EBSCO, Wiley, and ScienceDirect.

The inclusion and exclusion criteria in this research are as follows :

#### a. Inclusion Criteria

The inclusion criteria in this research were:

- 1) Articles published between 2010-2020
- 2) Articles published in English or Indonesian
- 3) Articles in full-text form
- 4) Articles with an open system ( open access )
- 5) Using the subject of teenage girls
- 6) Article research results using Moringa leaf extract intervention without any other intervention.
- 7) Articles with outcome hemoglobin levels

#### b. Exclusion Criteria

The exclusion criteria from this research are:

- 1) Articles that are literature reviews or systematic reviews
- 2) Literature in the form of reviews or opinions

### Search Results and Data Selection

The article selection process is described using a PRISMA flow diagram to transparently

describe the process that has been carried out. The article selection stage was carried out according to the criteria specified above by the researcher. Researchers use Zotero software in the process of selecting articles. In the excluding process, researchers use it manually. The stages of article screening are as follows; 1) Data is filtered through several databases namely PubMed, Wiley, EBSCO and ScienceDirect, and the google scholar service. Got a total of 1,158 search results, which are stored in Zotero,

Doing automatic duplicate article deletion in Zotero, there are 13 articles so the number of articles remaining is 1,145 articles, 3) Removing articles with

inappropriate study titles/abstracts, studies that do not use English/Indonesian, articles not in full-text form, articles not open access, in the form of article reviews, and literature in the form of theory or book reviews. The number of articles issued was 1,113 articles, and this was done by researchers manually, 4) Out of 32 articles, 23 articles with full text were excluded because they did not meet the criteria a) Subjects did not use female adolescents (n = 13), b) Interventions did not use extracts Moringa leaves or other interventions (n=9), and the outcome was not hemoglobin levels (n=1). So 9 articles are appropriate and can be used.

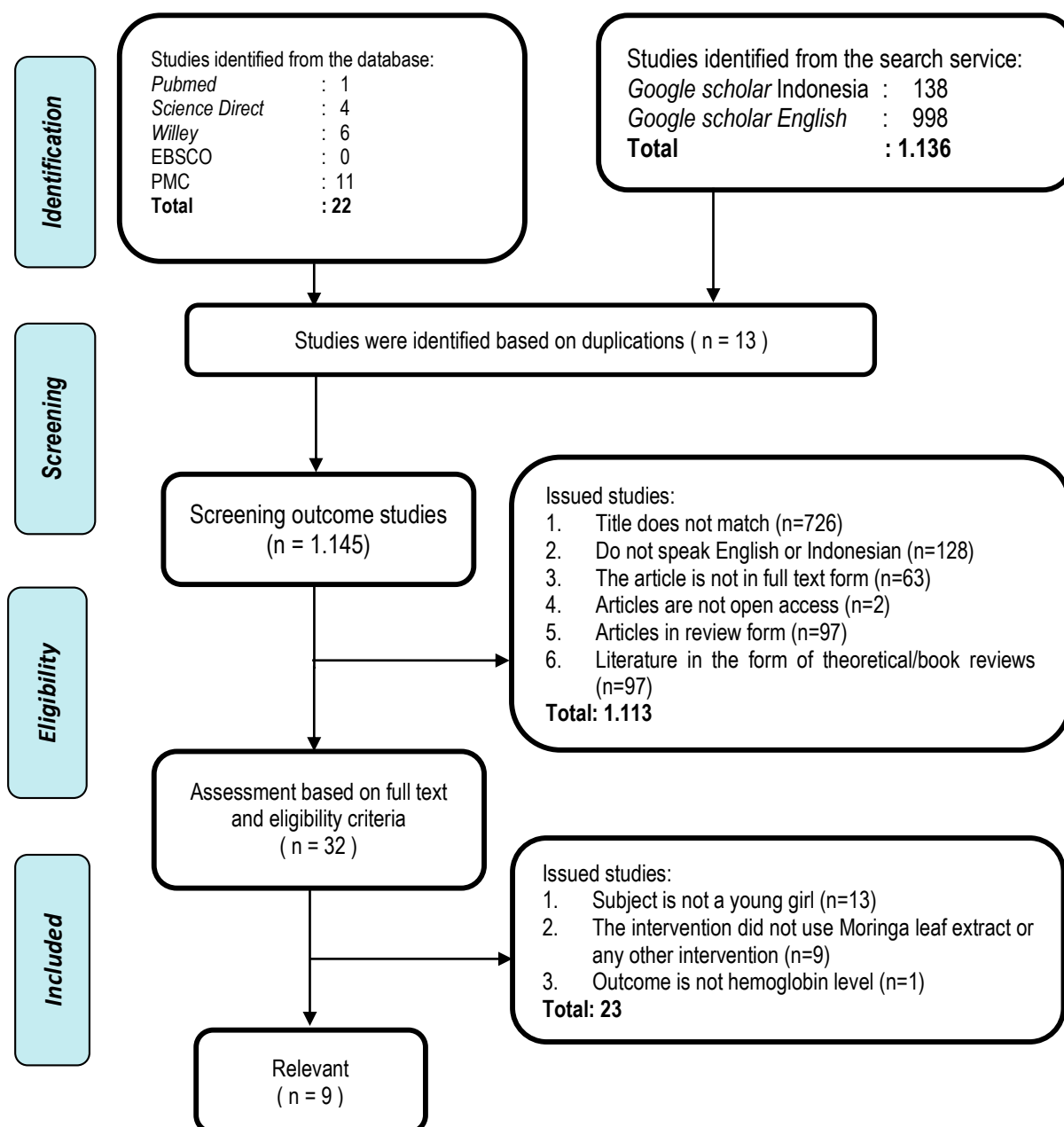


Figure 1. Article Search Process Flowchart I

**RESEARCH RESULTS**  
**Search Results Study**

The search results for articles using PICO obtained a total of 1,158 search results for articles.

There were 13 articles detected as duplicates. After being screened for inappropriate study titles/abstracts, studies that did not use English/Indonesian, articles not in full-text form, articles not open access, in the form of article reviews, and literature in the form of theory or book reviews, 1,113 articles were issued. Of the 32 articles that were re-selected according to the criteria based on a) the subject did not use female adolescents (n=13), b) the intervention did not use moringa leaf extract or any other intervention (n=9), and the outcome was not hemoglobin levels (n=1). In total there were 23 published articles, so there were 9 articles suitable for systematic review analysis.

### Study Quality and Risk of Bias

The entire article clearly states the characteristics of the samples taken. The variance among representatives belonging to the groups being compared is a threat to the validity of research studying causal relationships. If differences are found between representatives who enter the groups being compared, there is a risk of selection bias. Found 1 article that did not explain the method used in measuring hemoglobin levels.

Of the 8 articles using a quasi-experimental design, there is also a risk of bias because the study was conducted in only one group and the results were observed before and after the intervention was given.

Estimation bias in the study showed that the definite article results used in the systematic review were thought to result in selection bias because the majority of the sample sizes used non-probability techniques, namely 8 out of 9 articles that used Moringa leaf extract intervention, resulting in a lack of random selection procedures in the research sample.

### DISCUSSION

Based on the literature review that has been carried out conclusions can be drawn that giving the essence of Moringa leaves can affect the hemoglobin level of female adolescents. All the articles analyzed stated that there was an increase, in general, in the percentage of hemoglobin after being given the moringa leaf essence intervention, although there are some that do not fully explain the dose used. Based on research conducted by Tri Hartati, et al, it was found that the results found significant variation before and after giving powder tablets containing moringa a total of 70 mg per day which use for 14 days (2 weeks)(Hartati & Sunarsih, 2021).

The research is in line with the research results of Ponomban, et al who revealed that with the

provision of capsules in which there is Moringa leaf powder with a dose of 2 x 2 capsules per day (each capsule contains 500 mg of Moringa leaf powder) for 30 days can increase the percentage of hemoglobin in pregnant women. Research by Tende, et al (Tende, Ezekiel, Dikko, & Goji, 2011) submit that one way that can be lived to control Malnutrition is by using Moringa leaves for additional diet, because Moringa leaves contain very complete protein (contains 9 essential amino acids), calcium, iron, potassium, magnesium, zinc and vitamins A, C, E and B vitamins great benefits for the immune system (Ponomban, Walalangi, & Harikedua, 2013).

Moringa Oleifera or commonly called Moringa leaves are found in many tropical and subtropical regions, especially in Indonesia. Moringa can grow in even the harshest, driest soil though almost nothing else will grow. Moringa oleifera plants are easy to find. Due to their availability and easy use, moringa leaves can be prepared in all traditional recipes in fresh, boiled, or dry forms (Bey, 2010; Gull, Javed, Aslam, Mushtaq, & Athar, 2016; Nambiar, 2015).

Moringa is sometimes called "Mother's Best friend" and "Miracle Tree" Since 1998, WHO has been promoting moringa to supply choice imported food to treat malnutrition. Moringa provides a rich and rare combination of nutrients, amino acids, antioxidants, anti-aging, and anti-inflammatory properties that are used for nutrition and healing. The antioxidant and anti-inflammatory activity of ethanol essence as originally a natural antioxidant ah as a deterrent increases the development of various diseases such as recovery from anemia, cancer, constipation, diabetes, hypertension, kidney stones, thyroid disorders, and other diseases (Alhakmani, Kumar, & Khan, 2013; Mahmood, Mugal, & Haq, 2010). Research by Madukwe, et al states that Moringa leaf extract is rich in essential nutrients and can be used in food supplementation to improve the nutritional status of individuals and communities, especially in children, adolescents, and pregnant women (Madukwe, Ugwuoke, & Ezeugwu, 2013).

The nutritional content in Moringa leaves is 7 times the vitamin C in citrus fruits, 4 times the vitamin A in carrots, 4 times the calcium in milk, 3 times the potassium in bananas, 3 times the iron in spinach, and 2 times the protein found in yogurt or the protein contained in an egg. Moringa leaves contain very high iron (Fe), even the ability of iron in Moringa leaves that have been made into flour is much higher, namely 28.2 mg per 100 grams of flour made from Moringa leaves. has a high nutritional content. (Tinna) Similarly, Bey showed that the Fe content of Moringa leaf powder was 25 times more than

spinach, 10 times more vitamin A than carrots, and 7 times more vitamin C than oranges (Bey, 2010).

Based on Bey's research, it was revealed that there is a high amount of iron content in the leaves of *Moringa Oleifera*, especially when the leaves are fresh (Bey, 2010). However, control over the production of fresh *Moringa* leaves is very difficult to use as a benchmark. Because of the way each individual is made not the same. Therefore, *Moringa Oleifera* leaves or moringa leaves which is possible to be standardized and easy to control in the manufacturing process are in the form of powder. If the *Moringa* leaves are dried and in puree, if it is processed in such a way then the nutrients in them can be multiplied, except for the contents in it such as vitamin C. Increased nutrient content in dried *Moringa* leaves This is because the water content in *Moringa* leaves is still fresh and sucking, and the hot air that is released causes the hidden nutrient content to free the bonds in it (Ponomban et al., 2013).

Based on research conducted by Alessandro Leono, et al (Leone et al., 2015) obtain the results of observations of laboratory checks to determine the content of essential nutrients *Moringa* leaves from South Sulawesi, namely protein content of 25.25%, iron 91.72 mg, and vitamin A 33,991.51 ug, vitamin C 1125.71 mg and vitamin E 3.34 mg per 100 grams of material used. *Moringa* leaves dry it has a vitamin C content of 773 mg per 100 grams of dry matter. *Moringa* leaf essence supplements are also considered more effective in preventing anemia and can help the body maintain normal Hb levels in the blood (preventing anemia).

The 4th article that was researched by Lusi Indriani et al found one respondent in the intervention group expressed several complaints they felt in themselves such as dizziness, a heavy head, and feeling weak. This incident could have occurred allegedly because the respondent consumed *Moringa* leaf powder capsules on an empty stomach (had not eaten). Temporarily lately There is still no research on the side effects that will occur when using *Moringa* leaves. The entire article recommends giving *Moringa* leaf extract to teenage girls. Intensifying education and promotion of the benefits of *Moringa* leaves to people in the community (Indriani, Zaddana, Nurdin, & Sitinjak, 2019).

The limitations of this research are that there are still too few interventions on *Moringa* leaf extract and are only applied in several countries, some of which are supplemented with other interventions or in the form of fortification of the *Moringa* leaves themselves. *Moringa* leaves themselves also only grow in tropical or sub-tropical regions, so not many

countries have conducted research using *Moringa* leaf interventions.

## CONCLUSION

Based on the literature review that has been carried out, there is an effect of giving *Moringa* leaf essence (*Moringa Oleifera*) on blood hemoglobin levels in female adolescents.

## SUGGESTIONS

Authors hoped that this research will be carried out in more depth using other methods such as the systematic review method with meta-analysis or research using the same primary data as the subject which is more thorough and limits the characteristics of the subject by focusing on the factors that affect blood hemoglobin levels and further research related to the side effects of using *Moringa* leaves.

It is hoped that parents who have teenage daughters will provide food made from *moringa* leaves to meet the nutritional needs of adolescent girls so that anemia does not occur or treat anemia in female adolescents. It is hoped that health workers will intensify the benefits of *Moringa* leaves for the community.

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