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RESEARCH ARTICLE

Effect of Processed *Moringa oleifera* and *Clarias* sp. on Hemoglobin Levels of Pregnant Women

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Abstract

Anemia has a significant impact on maternal health, growth, and fetal development during pregnancy. These nutritional problems can be prevented by increasing food consumption containing protein and iron. One form of local wisdom used as an alternative is the use of *Moringa oleifera* leaves and *Clarias* sp. (catfish). This study aims to determine the effect of giving catfish nuggets mixed with *Moringa oleifera* leaf flour on hemoglobin levels in pregnant women with anemia. The design used in this study was experimental, with a one-group pre-post test design. This study consisted of a treatment group that received catfish nuggets and *Moringa oleifera* leaves and continued to take Fe tablets. The treatment group received nuggets for 30 days, once a day in the afternoon, and then the control group was given Fe tablets. The subjects in this study were 32 pregnant women who experienced anemia. This study was conducted from August 21 to September 20, 2024, at the Sesele Public Health Center in Lombok Barat regency. The results of the study showed that the p-value was smaller than the significance level of 5% (0.05), namely 0.000<0.05, catfish nuggets and *Moringa oleifera* leaves significantly affect the increase in hemoglobin levels in pregnant women. This study concludes that catfish nuggets and *Moringa oleifera* leaves can increase hemoglobin levels in pregnant women. Therefore, consuming catfish nuggets and *Moringa oleifera* leaves regularly can cure anemia.

Keywords: Catfish, hemoglobin, iron, *Moringa oleifera* leaves, pregnant women

Introduction

Anemia occurs when the body has fewer red blood cells (erythrocytes), which contain hemoglobin (Hb) that carries oxygen to all body tissues. Globally, in 2019, more than 500 million (29.9%) of reproductive-age women suffered from anemia, and 36.5% of them were pregnant women. Anemia has an impact on women's health and increases the adverse effects on mothers and newborn babies.[1] The nutritional status of pregnant women influences anemia status, which can cause low birth weight.[2–5] The Health Service of Nusa Tenggara Barat (NTB) reported that the percentage of pregnant women with NTB who experienced anemia increased to 10.88% in 2019.[6] Anemia in pregnant women can increase the risk of morbidity and death in the mother and baby.[7–9] Protein deficiency, energy deficiency, and iron deficiency anemia are among the most common nutritional problems among pregnant women in Indonesia.[10] The government's efforts to prevent anemia in pregnant women include administering one tablet daily, with a minimum of 90 tablets during pregnancy.[11]

Unfortunately, the data show that the level of compliance among pregnant women in consuming blood supplement tablets remains low.[12,13] One effort to improve the biochemical status of the blood, which causes anemia and chronic energy deficiency in pregnant women, is to provide additional food in the form of snacks that can be processed into nuggets and made at home (homemade).[14,15] *Clarias* sp. (catfish) can be used as the main ingredient for nuggets cause it has very high nutritional content, including albumin, protein, iron (Fe), zinc, calcium, and several vitamins.[14,16] *Moringa oleifera* leaves contain iron and vitamins, which are effective in increasing Hb levels in anemic adolescents and can help increase Hb.[17–19] Mixing *Moringa oleifera* leaf flour in making catfish nuggets can create a product for preventing and treating anemia in pregnant women.[20]

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In addition to local plants, efforts to address food-based stunting problems, particularly through the inclusion of animal protein sources, continue to be implemented to reduce the prevalence of stunted children. Fish consumption behavior is facilitated by utilizing the results of this fish processing, which serves as an alternative food source to prevent stunting. The protein contained in fish makes the highest contribution to the animal protein source group, accounting for approximately 57.2%. According to a previous study, findings indicate that giving *Moringa oleifera* leaf cilok has an effect on Hb levels in anemic teenage girls.[19] Another study found that catfish floss and *Moringa oleifera* leaves can be used to address cases of nutritional deficiency.[21] However, the results of these two studies have not been given to anemic pregnant women. The novelty of this study will modify previous study by adding protein derived from catfish with *Moringa oleifera* leaves into nuggets that will be consumed by anemic pregnant women on Hb levels in pregnant women as an effort to prevent stunting, and up to now, there has been no trial of giving catfish nuggets to anemic pregnant women.

This study aims to determine the effect of giving catfish nuggets mixed with *Moringa oleifera* leaves flour on hemoglobin levels in anemic pregnant women.

Methods

This study consists of several stages, including producing *Moringa oleifera* leaf catfish nuggets and the testing of the product. *Moringa oleifera* leaf catfish nuggets are made from catfish and *Moringa oleifera* leaves. The sample size presented to the panelists was 100 g of nugget formula. The ingredients used in making *Moringa oleifera* leaf catfish nuggets were catfish meat, moringa flour, wheat flour, eggs, garlic, shallots, pepper, salt, and breadcrumbs. This study has obtained research ethics from the Medical and Health Research Ethics Committee of the Faculty of Medicine, Universitas Islam Al-Azhar Mataram, with number 048/EC-04/FK-06/UNIZAR/VII/2024.

The nuggets produced were then checked for the content of iron compounds and vitamin C. The resulting *Moringa oleifera* leaf catfish nuggets were then analyzed for protein, carbohydrate, and vitamin C levels, and the production for research respondents were conducted at the Analytical Chemistry Laboratory of Universitas Mataram, Mataram city. Analysis of Fe levels at the Department of Environment and Forestry, Environmental Laboratory Center of Mataram city. The method was an experimental study with a one-group pre-post test design. The next step is to gather anemic pregnant women in one place to check Hb levels using Easy Touch before treatment. Hemoglobin levels were checked before the research subjects were given *Moringa oleifera* leaf catfish nuggets. The treatment group continued to take Fe tablets, while the control group received only Fe tablets for 30 days. Repeated Hb checks were carried out on day 31.

The research respondents were pregnant women who experienced anemia, with Hb levels ranging from 9–11 g/dl at Sesele West, Lombok. This study consisted of two groups of respondents. The treatment group received *Moringa oleifera* leaf catfish nuggets once a day in the afternoon, while the control group received one iron tablet daily for 30 days. The assessment was carried out on the 30th day by checking Hb levels using the Easy Touch brand Hb set. This study was assisted by five enumerators from the Midwifery Study Program at STIKes Yarsi Mataram, who distributed catfish nuggets, *Moringa oleifera* leaves, and Fe tablets to respondents. At the previous data processing stage, a data normality test was carried out first using the Shapiro-Wilk test; the data was said to be normal if the p-value was more than 0.05, then the effect of giving *Moringa oleifera* leaf catfish nuggets on the Hb levels of pregnant women using the t-test statistical test because data is usually distributed.

Results

The study results, which identified the Fe and vitamin C content in *Moringa oleifera* leaf catfish nuggets, are presented in Table 1. Table 2 explains that the data distribution is normal (treatment sig and control sig were greater than 0.05). The data is normally distributed if it has two complete population parameters, namely the mean and standard deviation. It has a bell-shaped curve and is symmetrical about the mean; the mode and median of the entire distribution are the same. The results of the Shapiro-Wilk test indicated that the data were normally distributed;

Table 1 Content Test Results of *Moringa oleifera* Leaf Catfish Nuggets

Content	Test Results (mg/100 g)
Vitamin C	30.42[a]
Iron	4.68[b]

Note: [a]titrimetry method, [b]atomic absorption spectroscopy (AAS) method

therefore, an independent test was carried out (Table 3).

Table 3 shows that there was an increase in the average (mean) Hb levels of pregnant women in the treatment group after receiving *Moringa oleifera* leaf catfish nuggets of 2.34 gr/dl, and this had a significant effect on increasing Hb levels in pregnant women (p=0.000; p<0.05). While in the control group, it did not have a significant effect on increasing Hb levels in pregnant women (p=0.106, p>0.05), although there was an increase in the average (mean) Hb levels of 0.31 gr/dl after receiving Fe tablets.

Table 3 Analysis of Hb Levels of Pregnant Women before and after Giving *Moringa oleifera* Leaf Catfish Nuggets to the Treatment Group

Variables	n	Mean (g/dl)	SD	p
Treatment group				
Hb levels before	16	9.74	0.74	0.000*
Hb levels after	16	12.08	1.16	
Control group				
Hb levels before	16	9.98	0.74	0.106
Hb levels after	16	10.29	1.16	

Note: *signifocance p<0.05

Discussion

The analysis results on pregnant women obtained p=0.000 (p<0.05), so it can be concluded that giving *Moringa oleifera* leaf catfish nuggets significantly affects the increase in Hb levels in pregnant women at Sesele Public Health Center. This means that giving *Moringa oleifera* leaf catfish nuggets increases Hb levels in pregnant anemic women. *Moringa oleifera* leaves contain Fe and vitamin C, which effectively increase Hb levels in anemic teenagers. In addition, *Moringa oleifera* leaves contain 10 times more vitamin A than carrots, 17 times more calcium than milk, 25 times more iron than spinach, 7 times more vitamin C than oranges, 9 times more protein than yogurt, and 15 times more potassium than bananas.[17–19,22–24] Mixing *Moringa oleifera* leaf flour into catfish nuggets can produce a product that can be used to prevent and treat anemia in pregnant women. A previous study's results showed that *Moringa oleifera* leaves contained Fe compounds and Vitamin C.[20]

The iron in catfish helps increase the Hb levels of pregnant women and prevents anemia—iron is a producer of hemoglobin in the blood. Hemoglobin is necessary for the body to carry oxygen to all tissues and nutrients that the mother and fetus need.[25,26]

Previous study states that the highest iron can be obtained with the addition of 20 grams of moringa leaves and 80 grams of catfish flour, which is 6.2 grams, and the lowest iron with the addition of 10 grams of moringa leaves and 90 grams of catfish flour is 4,7. The higher the addition of moringa leaves, the higher the iron value.[27]

Conclusion

The provision of catfish nuggets and *Moringa oleifera* leaves, along with the consumption of Fe tablets in the treatment group, significantly

Table 2 Data Normality Test

Variables	Groups	Shapiro-Wilk			Information
		Statistic	Df	Sig	
Hb pre	Control	0.975	16	0.909	Distributed data is normal
	Intervention	0.956	16	0.589	Distributed data is normal
Hb post	Control	0.933	16	0.267	Distributed data is normal
	Intervention	0.971	16	0.855	Distributed data is normal

increases Hb levels in pregnant women in the Sesele Health Center working area.

Conflict of Interest

There is no conflict of interest in this research.

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