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## **The Effect of Application Anemia Management Module on Improving Maternal Behaviors and Hemoglobin Level among Pregnant Women with Anemia**

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### **Article info**

#### **Article history:**

Received;

Revised:

Accepted:

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#### **DOI:**

<http://doi.org/10.35654/ijnhs.v3i5.330>

**Abstract.** Lack of knowledge of mothers on the importance of iron tablet consumption impact on compliance. Therefore, the iron requirement is not fulfilled, and the effect of anemia—countermeasures to raise awareness and behavior to increase hemoglobin levels. Educational modules consisted of information regarding pregnancy and the importance of anemia Fe tablet consumption. The study aimed to examine the effect of the anemia management module on behaviors change to improve hemoglobin levels. A quasi-experimental study, pre-test, and post-test with a non-equivalent control group were applied in this study. Samples were selected using the purposive sampling technique, where the intervention and control groups, respectively, 14 people. The data were analyzed using an independent t-test. The results found that the experimental group patients were a positive effect on knowledge, attitudes, and actions with p-value <0.01. However, it did not directly improve HB (p-value > 0.05). With its application for 30 days with biweekly visits, the anemia management module effectively changes the mother's behavior to improve knowledge, attitudes, actions, and modules. Use of the anemia management module as companion media education of health workers, especially in the range of PHC.

**Keyword:** Module, Behavior, Increased Hemoglobin



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## **INTRODUCTION**

Both indicators of maternal mortality demonstrated the success of the health services. The incidence of maternal mortality showed 359 per 100,000 KH in 2012 (1). It was due to the bleeding factor (30.3%) (2). Maternal Mortality in Semarang regency caused maternal deaths due to bleeding in 3 cases (3). Maternal mortality is closely related to pregnancy anemia due to iron deficiency anemia and bleeding (4). Iron deficiency anemia is anemia accounted for 50% of and causing 841 000 deaths per year worldwide. Africa and parts of Asia to bear 71% of the global mortality burden (5).

Iron deficiency anemia due to exhaustion of iron levels that affect hemoglobin levels. It was due to a decrease in the number of plasma volumes more than the sum of the mass of hemoglobin and red blood cell volume (6). The classification of anemia including mild anemia (Hb 10.0 to 10.9 g / dl), moderate anemia (Hb 7.0 to 9.9 g / dl), severe anemia (Hb <7.0 g / dl) (7). Pregnant women are anemic dangerous in pregnancy (8). In the fetus can cause premature delivery, Low Birth Weight Babies up to infant mortality. (9)

Pregnant women who have been consuming Fe tablet less than 90 tablets 61.9%, while pregnant women who consume pills 90 tablets 38.1% Fe. It shows the number of mothers who have dutifully swallow iron tablets(10). Case management deficiency anemia is by taking a tablet Fe. The side effects include heartburn, nausea, vomiting, and constipation (11).

Around 92.64% of pregnant women in Central Java province in 2017 that takes more than 90 tablets. Semarang District has the lowest coverage, which in 2016 amounted to 86.94%. Noncompliance Pregnant women due to a lack of knowledge and smelled fishy (3,12). This caused pregnant women to lack awareness and knowledge to take tablets regularly Fe. Knowledge gained from pregnant women to health information during pregnancy will impact expectant mothers' behavioral habits to maintain their health. The attitude towards how to address a problem shows indicators of a person's knowledge (13,14). One of the factors that most influence pregnant women's behavior or habits in consuming Fe tablet is knowledge. Education positively affects pregnant women's health in terms of behavior, namely knowledge and attitude in taking pills Fe (15,16). Intervention is most often performed and shown to have a significant level of success is the provision of counseling. (17)

Delivery of health education should be supported with modules for ease in reviewing the content of the message that has been delivered at health counseling (18). The provision of education with application modules can help steer the objectives because the modules are learning measures. The module is suitable for learning or teaching. There is a package of programs to train independent learning, i.e., learning objectives, learning materials, instructions on understanding correctly, exercises, and literature sources(19). Of the problems arranged in the background, the researchers studied the "Effect of Anemia Management Module Application of Behavior Change Mothers Against Efforts to Improve Hemoglobin In Pregnant Women With Anemia."

## **OBJECTIVE**

The study aimed to examine the effect of the application modules anemia management on behaviors change and to improve hemoglobin levels among pregnant women with anemia.

## **METHODS**

A quasi-experimental study, pre-test, and post-test, with non-equivalent control group design was applied in this study. A total of 8 samples were selected from puksemas Leyangan and Kalongan with a trimester. They were determined using the purposive sampling and divided into the intervention group who received the anemia management module, while the control group received the counseling orally for 10 minutes. The inclusion criteria of samples including

1) the second-trimester pregnant women who receive an iron tablet, HB levels of 7 to 10.9 g/dl, 2) be able to read and write in the Indonesia language, 3) 20-35 years. Pregnant women who have a history of blood disorders were excluded from this study.

The module anemia management was developed based on the patients' needs. The information found from the field and had been obtained input from the experts. It comprised two primary data, such as understanding the importance of anemia among pregnancy and iron tablet consumption for pregnant women. For knowledge, attitude, and action questionnaires developed by the researcher and tested for validity and reliability. The knowledge questionnaire was 25 questions with a favorable and unfavorable choice. The ratings were positive and negative statements such as very agree (score 4), agree (score 3), not agree (score 2), very not agree (score 1). After testing for validity, we found that three items were not valid. Therefore, we exclude three of those questions from the list. The attitude questionnaire consisted of 15 items with favorable and unfavorable statements.

The reliability test of the questionnaire was applied by using Cronbach Alpha consistency. The results demonstrated that the Alpha Cronbach's for knowledge questionnaire was 0.761. Whereas the attitude questionnaire was 0.766, and the action questionnaire was 0.794. The Cyanmethemoglobin method was used to assess the hemoglobin levels by using a pipette Thoma by 20 UI.

In this study, participants on the first day of education through the application module received 30 days, which previously administered a questionnaire to determine respondents' behavior. Once it is done with the education modules, as do education with the last module examination, hemoglobin levels

This study has been registered on the hospital ethics committee Moewardi Surakarta with 485 / IV / HREC / 2019. The descriptive analysis describes each variable's characteristics in percentage, age, MUAC, gravida, education. Shapiro Wilk normality test. To measure the difference before and after each group's knowledge, attitudes using a paired test and action and hemoglobin concentration using the Wilcoxon test. To test the difference before and after the intervention between intervention and control groups to test knowledge and attitudes using independent t-test, the action and HB levels using the Mann-Whitney test and subsequently followed by regression.

## **RESULT**

### **Characteristics of Respondents**

Table 4.1 showed that most of the intervention group respondents are 21-35 years (100%) in the control group aged 21-35 years (92.9%). Most respondents were from secondary education (71.4%) in the control group, a high school education (57.1%). Respondents in the intervention group, mainly with no nutritional status of SEZ (100%), and the control group did not KEK (100%). Respondents in the intervention group had a history of similar gravida respectively (50%) and the control group gravida 2 (57.1%)

Table 1 Characteristic of Respondents

Characteristic respondents	Intervention		Control		P-value
	N	%	N	%	
<b>Age</b>					
<20 years	0	0.0	1	7.1	.609
21-35 years	14	100.0	13	92.9	
> 35 years	0	0.0	0	0	
<b>Education</b>					
Basic	3	21.4	6	42.9	.329
secondary	10	71.4	8	57.1	
High	1	7.1	0	0.0	
<b>Nutritional status</b>					
Normal	14	100.0	14	100.0	0.548
Not normal	0	0	0	0.0	
<b>gravida</b>					
gravida 1	7	50.0	6	42.9	1.00
gravida 2	7	50.0	8	57.1	

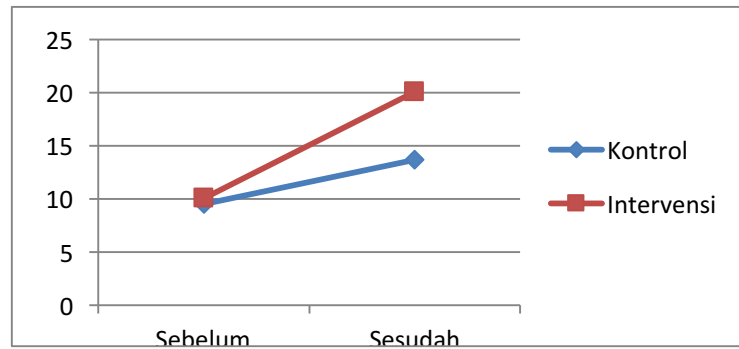
\* *Chi-Square***Mean difference of knowledge among the intervention group and control group**

Table 2 showed the mean of knowledge in the intervention group before and after treatment was 10.07 and 20.07 with a p-value <0.05. It means that there are differences in knowledge before and after treatment for one month. While the average value of knowledge in the control group before the treatment showed a mean value of 9.57 and after treatment, the mean values 13,7 dengan Statistical results p-value <0.05 where there is a difference before and after treatment the control group treated with counseling lecturer.

Table 2 Mean difference of knowledge among the intervention group and the control group.

Group	Knowledge			P-Value
	Before Mean ± SD	After Mean ± SD	Mean Δ	
Intervention	10.07 ± 1.97	20.07 ± 1.07	10.00	0.0001
Control	9.57 ± 1.91	13.7 ± 0.89	4.13	0.0001

\* *Paired t-Test*



**Figure 4.1** Increasing Knowledge Graph before and after receiving the intervention

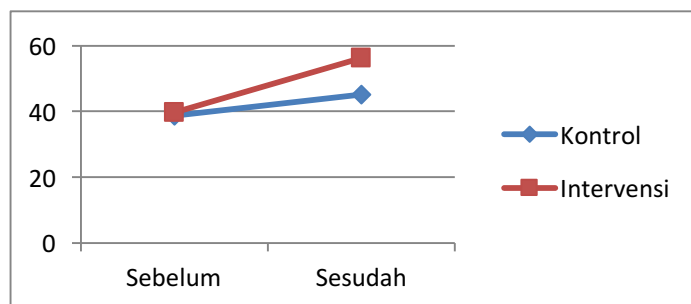
**Mean difference of attitude among the intervention group and control group**

Table 3 showed the average value of the attitude of Paired t-test results in the intervention group before treatment after a mean of 39.07 and a mean value of 56.2 with statistical results p-value <0.05. While the mean of attitude in the control group before the treatment was 38.7 and 45.2 after treatment with p-value <0.05. It was indicated that there is a difference in attitude and after treatment

Table 3 Mean difference of attitude among the intervention group and the control group.

Group	Attitude		Mean Δ	P-Value
	Before Mean ± SD	After Mean ± SD		
Intervention	39.07 ± 4.21	56.2 ± 2.45	17.13	0.0001
Control	38.7 ± 2.61	45.2 ± 2.69	6.5	0.0001

\* Paired t-Test



**Figure 4.2** Graph Improved attitudes before and after In the Control Group and Intervention

Table 4.4 Mean difference of action before and after implementation among the intervention group and the control group.

Group	Action		$\Delta$ mean	P-Value
	Before Mean $\pm$ SD	After Mean $\pm$ SD		
Intervention	4.8 $\pm$ 0.94	8.7 $\pm$ 1.12	3.9	0.001
Control	4.4 $\pm$ 1.08	6.5 $\pm$ 1.08	2.1	0.001

\* *Wilcoxon*

Table 4.4 showed the average value of knowledge is based on Wilcoxon, the intervention group before treatment after a mean of 4.8, and a mean value of 8.7. The statistical results p-value  $<0.05$ . There are differences of action before and after treatment using the anemia management module for one month. While the mean of action before the treatment control group was 4.4 and 6.5 after treatment with p-value  $<0.05$ . It was indicated that there are differences in the action before and after treatment.

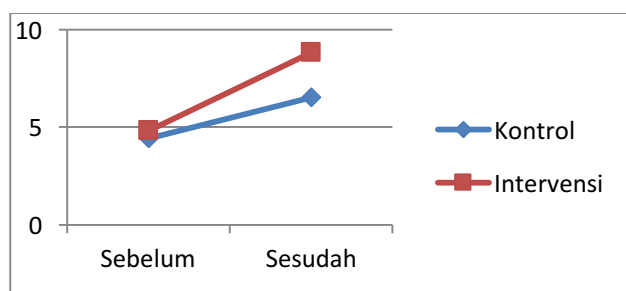


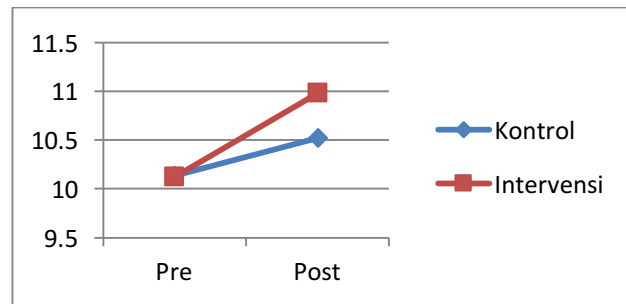
Figure 4.3 Graph and Actions Before and After On Intervention and control groups

Table 4.5 Mean difference of hemoglobin before and after implementation among the intervention group and the control group.

Group	Hemoglobin levels		$\Delta$ mean	P-Value
	Before Mean $\pm$ SD	After Mean $\pm$ SD		
Intervention	10.12 $\pm$ 0.40	10.98 $\pm$ 0.24	0.85	0.001
Control	10.13 $\pm$ 0.60	10.52 $\pm$ 0.6	0.22	0.001

\* *Wilcoxon*

Based on Table 4.6 shows that the results of the Wilcoxon test in the intervention group before treatment had a mean value of 10.12  $\pm$  0.40 and after treatment, the mean value of 10.98  $\pm$  0.24 with statistical results p-value  $<0.05$ , which means that there are differences in levels of hemoglobin before and after the intervention group. While the average value of Hb levels in the control group before treatment, the mean value of 10.13  $\pm$  0.60. After treatment, the mean value of 10.52  $\pm$  0.6 with statistical results p-value  $<0.05$  means that there are differences in hemoglobin levels before and after the control group.



**Figure 4.4** Graph hemoglobin levels before and after

**Table 4.6** Differences in Knowledge, Attitudes, Actions, and Levels Hemoglobin Interagency Intervention Group and Control Group

variables	Group		<i>P-Value</i>
	Intervention Mean ± SD	Control Mean ± SD	
<b>Knowledge</b>			
Before	10.07 ± 1.97	9.57 ± 1.91	0.502*
After	20.07 ± 1.07	13.7 ± 0.89	0,000*
Difference	10.00 ± 2.71	4.14 ± 1.74	0,000*
<b>Attitude</b>			
Before	39.07 ± 4.21	38.71 ± 2.61	.790*
After	56.2 ± 2.45	45.21 ± 2.69	0,000*
Difference	17.1 ± 4.22	6.5 ± 2.40	0,000*
<b>Action</b>			
Before	4.8 ± 0.94	4.4 ± 1.08	0,312**
After	8.7 ± 1.12	6.5 ± 1.08	0,000**
Difference	4.07 ± 1.54	2.14 ± 0.86	0,000**
<b>Hb</b>			
Before			
After	10.12 ± 0.40	10.13 ± 0.60	.549**
Difference	0.86 ± 0.46	0.39 ± 0.10	0,000**
<b>Knowledge</b>			
Before	10.07 ± 1.97	9.57 ± 1.91	0.502*
After	20.07 ± 1.07	13.7 ± 0.89	0,000*
Difference	10.00 ± 2.71	4.14 ± 1.74	0,000*
<b>Attitude</b>			
Before	39.07 ± 4.21	38.71 ± 2.61	.790*
After	56.2 ± 2.45	45.21 ± 2.69	0,000*
Difference	17.1 ± 4.22	6.5 ± 2.40	0,000*
<b>Action</b>			
Before	4.8 ± 0.94	4.4 ± 1.08	0,312**
After	8.7 ± 1.12	6.5 ± 1.08	0,000**
Difference	4.07 ± 1.54	2.14 ± 0.86	0,000**
<b>Hb</b>			

Before			
After	10.12 ± 0.40	10.13 ± 0.60	.549**
Difference	10.98 ± 0.24	10.52 ± 0.6	0.045**
	0.86 ± 0.46	0.39 ± 0.10	0,000**

\* *Independent Test t-Test*

\*\* *Mann Whitney*

Table 4.6 showed that the knowledge and attitudes were significant between the intervention and control p-value <0.05. The mean difference in the intervention group was 10.00, and the control group was 4.14, with a p-value of 0.00. The mean value of the intervention group's attitude was 17.1 and in the control group was 6.5 with a value of p-value <0.05. The action and hemoglobin concentration using the Mann Whitney test is obtained by the average value of the intervention group's action was 4.07 and in the control group was 2.17. The mean value of the hemoglobin level was 0.86 in the intervention group, and the control group was 0.39.

Table 4.7 Effect of Anemia Management Module Implementation Of Knowledge, Attitudes, Actions

Model	R	R Square	(E) 1	p-value	
Group	Knowledge	.957	0.916	.289	0,001 *
	Attitude	0.911	0.831	0.411	0,001 *
	Action	.777	.603	.630	0,001 *

*linear regression test*

\* *Level of significance  $\alpha > 0.05$*

Based on Table 4.7, for the first model of knowledge treatment, using the linear regression test results obtained a p-value of 0.001, which means there is a significant effect between the application modules and the increase of knowledge. Second, the treatment effect on attitudes using linear regression test results obtained a p-value of 0.001, which means there is a significant effect between the application modules to increase attitude. Third, the impact of the treatment of the action using linear regression test results obtained a p-value of 0.001, which means there is a significant effect between the application modules to increased action.

The analysis above refused and was accepted (p-value=0.05), which means there is an influence of modules on knowledge, attitudes, and actions.

Table 4.8 Effect of Treatment with the knowledge, attitudes, and action against hemoglobin

Model	R	R Square	(E) 2	p-value
Module Hemoglobin levels	0.507	0.257	0.861	0.231 *

*linear regression test*

\* *Level of significance  $\alpha > 0.05$*

In Table 4.8, it can be interpreted that the results of the linear regression models obtained p-value 0.231 ( $p > 0.05$ ), then  $H_0$  is accepted and  $H_a$  is rejected it means there is no direct effect of an anemia management module to increase hemoglobin levels. The contribution of treatment effect on hemoglobin level of 25.7%.

## DISCUSSION

### 1. Effect of Anemia Management Application Module To Change Behavior (Knowledge, Attitudes, and Actions)

#### a. Increased Knowledge

This study showed that counseling through the management of anemia module has several advantages: memorable, delivery of materials may be more profound than that pregnant women may wish to review or learn again reached the point she understands about the material in the module. The use of media modules can improve knowledge of lactation management. Increasing understanding of health education is done through efforts to generate increased proficiency in a short time to behave following health values (20).

The iron insufficiency occurred in many developing countries since most pregnant women eat cereals, beans, processed products, and green vegetables (21). This study on several items of mothers' knowledge has increased compared to the control group is the understanding of anemia. Due to the causes of anemia, the number of doses of an iron tablet taken, and how to consume iron tablets in the right way. For example, to drink vitamin C such as oranges, guava and avoid drinks that inhibit iron, i.e., swallowing iron tablets along with tea, coffee, or milk). Other efforts to prevent anemia are high iron-containing foods (eggs, fish, chicken liver, green vegetables). In general, nutrition education and counseling, increase pregnant women's food intake, including practices and macronutrient intake of specific micronutrients such as green vegetables and protein (22). The health module was effective in enhancing the teachers' knowledge in District South Purwokerto (18).

Including health education aims to improve health and prevent disease, maintain the health of existing ones, maximize the function and role of patients during illness, and help patients and families cope with the health problem (19). The health education program is one factor that can increase knowledge about the disease and needed a guide to improving understanding of the prevention of the disease (20)

#### b. Improved attitude

The health education media to influence a person's attitude. This media is also increasing interest in the target to forward the message to others. Changes in attitude on the respondents indicated that the intervention was effective for patients. The success is supported by various factors, including strategy, engineering, media are used as a tool. 21 The impact of nutrition education will also raise awareness about the risk of iron deficiency anemia. Thus, forming the attitude to overcome anemia, for example, trust arising, wants to recover from anemia and smooth delivery. The expectant mother is to have confidence in the skills to manage the anemia (23).

Anemia prevention education was used to enhance knowledge and attitudes. Therefore, it makes it easier for pregnant women to adopt healthy behaviors that anemia can be prevented as early as possible. If it happens, anemia can be immediately handled. It is supported by theory from Notoatmojo mentioned that a change in a person's behavior is influenced by the knowledge and attitudes they have (14, 24).

#### c. Improvement measures

Changes in the intervention group's capital actions who received education through an anemia management module are relatively higher. Increased found on

several items. First, of habitual ways Fe with good tablet consumption (consuming the juice, avoiding the consumption of iron tablets along with tea, coffee, or milk), both how management menu and choose foods that are good sources of animal protein. Then, select and process green vegetables correctly so that the nutrients' content is maintained.

The action will be lasting if it is constituted with knowledge and the right attitude(25.)One effort to improve compliance TTD consumption by providing information on the management of anemia increases the importance of iron supplementation. It gives information on the trust that is not true of the iron tablet. TTD administration supervision from health and counseling improved adherence to consumption. Provision of educational interventions appropriately promotion by health care workers can help measure efforts to prevent anemia (26-27)

## **2. Effect of Anemia Management Module Implementation Of Content Hemoglobin**

Hb rate hikes that are superior due to anemia management education through the module is integrated learning that facilitates increased knowledge, attitude, and actions for consuming the iron tablets. Mother to be educated regularly at the end of the study can improve hemoglobin levels significantly. This is because the information on the management of anemia acceptable mother and learning occurs. In line with several studies done, pregnant women who receive nutrition education or counseling would be more compliant in taking iron supplementation in the intervention group increased adherence to iron tablet consumption (26-27).

Meanwhile, path analysis using the regression test module obtained through direct education did not affect hemoglobin levels, with  $p > 0.05$ . Although statistically not affect the reality on the ground in the intervention group, the module can increase the hemoglobin level of 0.8 g / dL. Due to learning the module's compliance, the Fe tablets manage nutrients for pregnant women such as counseling anemia sourced consumption of animal protein, green vegetables, and fruits as a source of vitamin C.

No significant results on hemoglobin levels due to several factors during pregnancy will be changes in the mother's blood circulatory system. The red blood cell count unbalanced causes hemodilution, resulting in a decrease in hemoglobin levels will peak at 16 weeks gestation. Both attempt to increase the hemoglobin level, efforts should be made to approach the expectant mother that he felt cared for with the condition of pregnancy. Also, the provision of family support and health care workers, for example, a husband always reminded when to take the tablet Fe, by eating correctly and contribute to the provision of compliance foods that contain good sources of iron and animal protein.

## **CONCLUSION**

Application of modules for 30 days with a visit once every two weeks affects maternal behavior changes as indicated by the increased knowledge of 10 points in the treatment group and the control group 4 points. The statistical anemia management module application does not directly influence pregnant women's hemoglobin levels with  $p \text{ value} > 0.05$ . Although statistic does not directly affect hemoglobin levels, the reality on the ground in the intervention group had a higher HB level of 0.47 g / dL than the control group.

## Recommendation

**This study provided the valuable recommendation for pregnant women to apply the anemia management** for maintaining the condition during pregnancy. For health care services may apply the education strategy to strengthen the capacity building for maintain the program.

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