THE EFFECT OF EMPOWERMENT UPON THE FOOD INTAKE AND THE HEMOGLOBIN LEVEL OF PREGNANT WOMEN IN COASTAL AREAS

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ABSTRACT

This research aimed to analyze the effect of an intervention in the form of empowerment through counseling pregnant women with anemia on changes in food intake and the Hb level in Percut Village of Deli Serdang Regency, North Sumatra, Indonesia. This was quasi-experimental research using the untreated control group design with pretest and posttest. The intervention was given to 64 pregnant women, who were divided into 2 (two) groups. Group 1 was given the intervention through empowerment, while Group 2 was the control group and did not receive any empowerment. The empowerment was given in the form of counseling on the problem of anemia in pregnant women conducted for 4 (four) meetings within 3 (three) months. The findings suggested that the group with the empowerment intervention experienced an increase in their food intake by 6,24 times higher than that of the group without the empowerment intervention. The effect of such empowerment upon the changes in the hemoglobin level of pregnant women showed an average increase by 3.89 times higher for the group with empowerment than than that of the group without empowerment. Based on the multivariate analysis using multiple linear regression, it was revealed that the variables with the most significant effect on the change in the Hb level were empowerment of pregnant women, protein intake and iron intake. Furthermore, the findings concluded that the empowerment of pregnant women would more effectively enhance the food intake and the hemoglobin level of pregnant women, which in turn may prevent anemia among these pregnant women.

Keywords : Empowerment, Food Intake, Manganese, Zinc, Iron and Anemia in Pregnant Women.

1. INTRODUCTION

According to the Indonesia Ministry of Health (2013), measures to improve maternal health still face many challenges, especially in reducing the rate of anemia in pregnant women, either directly or indirectly related to the problem of anemia, and remain one of the most important programs of the government. Despite the implementation of the policy on supplementation of blood-boosting tablets (iron tablets) since 1970s, the prevalence of anemia among pregnant women in Indonesia is still high. Hormonal changes during pregnancy that usually cause nausea to vomiting, dizziness and other common complaints constitute the main factors why pregnant women refuse to take iron tablets during their pregnancy.

Pregnant women with anemia are vulnerable to the bleeding risk in the course of deliveries which in turn increases the risk of death. Of 100,000 women giving birth, there were 228 in 2007, and it is expected to decrease to 118 in 2014, women who died in childbirth (Indonesia Ministry of Health, 2012). There are a number of factors which cause anemia, including a low iron intake. The low iron intake is caused by lack of consumption of iron-containing food. The poor diet quality is usually resulted from wrong eating habits due to lack of knowledge (Kim Sook Hie et al., 2002; Ramakrishnan, 2002). A survey conducted in 2012 by the Health Polytechnic of Medan showed that 75% of pregnant women in the village of Percut Sei Tuan located in a coastal area suffered from anemia. It is much higher when compared with the data on pregnant womens with anemia the Indonesia Ministry of Health (2013) collected through the Basic Health Research program which revealed that the prevalence of anemia among pregnant women in Indonesia was 36.4% in urban areas and 37.8% in rural areas. Based on the data obtained, it is necessary to undertake research to determine the effect of empowerment for pregnant women as an alternative to help cope with the existing problems.

2. LITERATURE REVIEW

According to the WHO (1998), anemia in pregnancy is defined as a condition when the hemoglobin or Hb level is less than 11 g/dl. More clearly, it refers to deficiency of nutrition required for the synthesis of erythrocytes, particularly fe, vitamin B_{12} and folic acid. During pregnancy, the body lacks some nutrition which is likely to cause anemia (Hoffbrand, 2005). Anemia as a result of malnutrition is referred to as nutritional anemia, however as it is largely due to iron deficiency, then it is commonly known as iron deficiency anemia (Kim Sook Hie et al., 2002; Nazir G, 2011). Anemia may bring different impacts on pregnancy, ranging from minor complaints to conditions that may threaten continuity of the pregnancy (miscarriage, premature parturition), problems to delivery processes (inertia, prolonged parturition, atonic bleeding), postpartum disorders (subinvolution of the womb, lower resistance to infection and stress, lower production of breast milk) as well as fetal disorders, which include: miscarriage, dysmaturity, microsomy, low birth weight and perinatal mortality (Ronnenberg et al., 2004). The review of the report on research by Brabin et al. (2001) in hospitals published to the public in Africa, Asia and Latin America concluded that the prevalence of severe anemia is strongly correlated with maternal mortality.

Lack of public awareness on the health of pregnant women is a factor determining maternal mortality. The mortality of mothers in childbirth is resulted from various factors. Among those factors, bleeding due to iron deficiency anemia (28%) is found to be the main cause of maternal death (Indonesia Ministry of Health , 2013). Generally, anemia is caused by a couple of things, including a low intake of iron. The low iron intake is caused by lack of consumption of iron-rich food due to lack of knowledge. The adequate intake and absorption can be achieved by eating food that can increase the iron intake. To prevent/ overcome iron deficiency, the quality of food consumed needs to be improved (Kim Sook Hie et al., 2002; Ramakrishnan, 2002). Several research findings concluded that without proper iron supplementation, the incidence of iron deficiency anemia in women of childbearing age would be more dangerous. Furthermore, this risk will increase in pregnant women which eventually will cause the maternal mortality rate to be higher (Hasson et al., 1999; Ronnenberg et al., 2004; Brabin, 2001; Levy, 2003).

Results of the research by Ramakrishnan (2002) concluded that in order to get the appropriate intervention results, it is necessary to employ strategies through a new program in

order to improve the nutritional status of women of childbearing age so as to cope with the problem of anemia in pregnant women in accordance with their respective socio-economic condition, especially that of the poor living in rural and urban areas (Bentley et al., 2003; Vitery et al., 2005). According Notoatmodjo (2012), one's health condition is influenced by the health behavior of a group or society. Good health behavior will be formed if the individual has been able to independently maintain and protect their health. To this end, empowerment which is an attempt or process to raise awareness, willingness and ability to identify, overcome, maintain and protect their health is required by increasing health-related knowledge as necessary. According to Chambers and Robert (1984), empowerment is defined as a process of making a helpless/ less helpless party be helpful. Meanwhile, Ife (1995) limits empowerment to efforts to provide opportunity, knowledge and skills to improve one's ability to determine their future and to participate in and influence the lives of their community. To provide these opportunity, knowledge and skills to empower a community, counseling is deemed effective (Paul, 1987; Kartasasmita, 1996; Payne, 1997; Notoatmodjo, 2012).

3. METHODOLOGY

This was quasi-experimental research using the untreated control group design with pretest and posttest (Madiono in Sudigdo, 2011; Campbell, 1963; Shadish et al., 2002). It was conducted in the village of Percut to 64 pregnant women divided into two groups. Group 1 (32 pregnant women) was given the intervention through empowerment, while Group 2 (32 pregnant women) was the control group and did not receive any empowerment. The empowerment was given in the form of counseling on conducted for 4 (four) meetings within 3 (three) months on: causes, consequences, prevention and alternative countermeasures against anemia in pregnant women. The data collected before and after the intervention included the data on the food intake (Energy, Protein, Fat, Carbohydrate, B6, B9, B12, Calcium, Manganese, Zinc and Iron (Fe)) using 24-hour food recalls and the data on the hemoglobin level measured using the Digital Checkup the "*Easy Touch*" brand which had been calibrated.

4. RESULTS

After the intervention, an increase in the Hb level among pregnant women of the control group and the intervention group is presented as follows (Table 1)

Table 1 Pregnant Women's Hemoglobin Level Before and After the Intervention

Group	n	Mean (mg/dl)	Hb Level (mg/dl)		Anemia (Hb Level < 11mg/dl)		Anemia (Hb Level < 11mg/dl)		p-value
			Lower	Upper	n	%	n	%	
Before the Intervention									
Without Empowerment	32	9.80	9.80	10.80	32	100	0	0	0,001
With Empowerment	32	9.21	7.80	10.60	32	100	0	0	
After the Intervention									
Without Empowerment	32	10.26	8.80	11.80	28	87,5	4	12,5	0,001
With Empowerment	32	11.02	9.00	12.60	7	21,97	25	73,13	

Source: Primary Data Processed (2015).

The average food intake of pregnant women before the intervention included the following nutritional content: Energy, Protein, Fat, Carbohydrate, B6, B9, B12, Calcium, Manganese, Zinc and Iron. After undertaking an analysis of the food recall data using the Nutry Survey program, it indicated that there was a significantly higher increase in the group with empowerment compared the group without empowerment (p-value < 0.05), which can be seen in Table 2 below.

Table 2 The Average Food intake of Pregnant Women Based on Before-Intervention and After-Intervention Groups

No	Food intake	Group				p-value	
		Without Empowerment		With Empowerment			
		Before	After	Before	After	Before	After
1	Energy (kcal)	1127	1173	1337	1858	0.001	0.001
2	Protein (g)	39.23	45.69	44.43	57.63	0.032	0.001
3	Fat (g)	28.13	29.15	33.15	53.67	0.027	0.001
4	Carbohydrate (g)	1756	1784	2032	2327	0.005	0.001
5	B6 (mg)	0.73	0.76	0.95	1.13	0.009	0.001
6	B9 (mcg)	506	542	510	723	0.936	0.001
7	B12 (mcg)	1.5	1.5	1.8	2.1	0.003	0.001
8	Calcium (mg)	2783	2093	2517	3286	0.322	0.001
9	Manganese (mg)	2.03	2.08	2.33	2.97	0.072	0.001
10	Zinc (mg)	4.35	4.61	5.12	6.09	0.012	0.001
11	Fe (mg)	6.68	6.50	5.91	9.73	0.033	0.001

Source: Primary Data Processed (2015).

After the intervention, the average food intake of pregnant women in the group with empowerment was significantly higher than pregnant women in the group without empowerment. This difference in the increased intake of nutrition after the intervention in both groups showed a significant difference at the level of p < 0.005 where the empowerment group generated a higher increase. The data implied that empowerment influenced the average increase of food intake 6,24 times higher in the intervention group to which empowerment was given compared with the group without empowerment.

Table 3 Differences in the Increased Food intake of Pregnant Women in the Intervention Group

No	Food intake	Group		p-Value
		Intervention (With Empowerment)	Control (Without Empowerment)	
1	Energy (kcal)	52.03	45.86	0.001
2	Protein (g)	13.20	6.34	0.006
3	Fat (g)	20.51	1.02	0.001
4	Carbohydrate (g)	29.53	2.86	0.001
5	B6 (mg)	1.18	0.23	0.014
6	B9 (mcg)	21.22	10.69	0.001
7	B12 (mcg)	0.35	0.09	0.007
8	Calcium (mg)	76.99	68.9	0.001
9	Manganese (mg)	1.92	0.14	0.001
10	Zinc (mg)	0.97	0.26	0.022
11	Fe (mg)	3.82	-1.4	0.001

Source: Primary Data Processed (2015).

The effect of food intake without empowerment upon the increased hemoglobin level of pregnant women was analyzed using multiple linear regression. Furthermore, from the analysis results, it was revealed that the most influential factor which increase the hemoglobin level of pregnant women was the intake of protein and Fe.

Table 4 The Model of Countermeasures against Anemia in Pregnant Women Based on Food intake

Variable	R	R^2	Equation	p-Value
Consumption of Protein	0.733[a]	0.537	Ỹ= 0.529 + 0.025*Kpr +	0.004
Consumption of Fe			0.195*Kfe + μ	0.001

Source: Primary Data Processed (2015).

From the data presented in Table 4, the equation illustrating the effect of food intake without empowerment upon the increase in the hemoglobin level of pregnant women can be defined as follows:

$$\check{Y} = 0.529 + 0.025 *Kpr + 0.195*Kfe + 0.111$$

Description:
Ỹ = changes in the Hb level
Kpr = protein intake;
Kfe = Fe intake;
0.111 = error standard

This equation showed that nutrition affecting the hemoglobin levelof pregnant women consisted of the protein intake by 0.025 mg/ dl and the Fe intake by 0.195 mg/ dl. In relation to the effect arising from the food intake accompanied by empowerment upon the increase in the hemoglobin level of pregnant women through the multiple linear analysis, the following model of countermeasures against anemia in pregnant women was generated:

Tabel 5 The Model of Countermeasures against Anemia in Pregnant Women Based on the Empowerment of Pregnant Women

Variable	R	R^2	Equation	p-Value
Empowerment of Pregnant Women			Ỹ= - 0,723 + 1,041*Pi + 0,003*Kpr + 0,026* Kfe + μ	0.001
Consumption of Protein	0.824[a]	0.680		0.001
Consumption of Fe				0.001

Source: Primary Data Processed (2015).

Based on the multivariate analysis results using multiple linear regression presented in Table 5 above, it was uncovered that the variables with the most significant effect on the change in the Hb level were empowerment of pregnant women, the protein intake and the Fe intake. Thus, the multiple linear regression equation that affects the hemoglobin level is presented as follows:

$$\check{Y}= - 0,723 + 1,041*Pi + 0,003*Kpr + 0,026* Kfe + \mu$$

Description:
Ỹ = changes in the Hb level of a group
Pi = empowerment of pregnant women
Kpr = protein intake
Kfe = Fe intake
0,202 = error standard

Based on the equation, it can be explained that the effect arising from the food intake which was not coupled with empowerment could increase the hemoglobin level of pregnant

women by 0.22 mg/ dl while the food intake coupled with empowerment could increase the hemoglobin level of pregnant women by 1.074 mg/ dl. These data suggest that empowerment is 4,88 times more effective in improving the hemoglobin level of pregnant women compared with the absence of empowerment.

5. DISCUSSION

The bivariate analysis results using linear regression on the empowerment of pregnant women and the increased level of hemoglobin indicated that there was a singnifikan effect with a p-value by 0.001 (Table 1). Furthermore, the analysis of the effect of the empowerment variable upon the food intake variable generated a significant result ($p < 0.05$), meaning that empowerment brings about a significant increase in the food intake of pregnant women (Table 2). Based on the analysis of the effect of the food intake variable upon the increased level of hemoglobin of pregnant women, it was revealed that without empowerment, the food intake could increase the level of hemoglobin of pregnant women by 0.22 mg/ dl (Table 4). However, if combined with the intervention in the form of empowerment, it had a greater influence on the increased hemoglobin level of pregnant women, which was equal to 1.074 (Table 5). It implied that the intervention in the form of empowerment could increase the hemoglobin level of pregnant women 4,88 times greater than in the absence of empowerment. Moreover, the resulting model to cope with the problem of anemia among pregnant women through empowerment showed that 68.0% (R^2) of the regression equation model could explain well (R^2> 60%) that the change in the hemoglobin level of pregnant women was affected by empowerment as well as the proein and Fe intake.

The attempt to empower pregnant women who suffered from anemia at the end of the research showed that the problem of anemia among pregnant women could be addressed. The term *empowerment* in the present research was carried out through gradual counseling, which included: counseling on the problem of anemia itself along with the possible threats it poses, what causes anemia and what efforts to take to get rid of it, the role of local foodstuffs in overcoming anemia as well as ways to make various food using these local foodstuffs. Based on the final data collected, after the intervention for 3 (three) months in the form of counseling undertaken 3 (three) times each at the beginning of the month, the research discovered a significantly higher increase in the consumption of protein-rich food in the empowerment group compared with the non-empowerment group. Based on the results of the interviews with pregnant women to collect the data on food intake after the intervention, it was revealed that pregnant women now knew that anemia is a very serious problem as it may affect the future of their child and threaten the lives of mothers during childbirth. These encourage them to increase the consumption of protein-rich food such as fish and shrimp which they can find easily in their residential area.

6. CONCLUSIONS

Empowering pregnant women through counseling on issues they were dealing with helped them increase their knowledge about anemia and raise their awareness to overcome their problems, which ultimately encouraged them to improve their food intake, especially protein-rich food. The increased protein intake among pregnant women of the empowerment group which was higher than that of the non-empowerment group led to the increased Fe intake, which in turn increased the Hb level of pregnant women in the empowerment group.

6.1. Limitation

This research did not conduct medical examinations on infectious and genetic diseases which may be suffered and influence the hemoglobin level of the research sample.

6.2. Recommendation

Hopefully the findings of this research can help support the implementation of government programs aimed at addressing the problem of anemia among pregnant women in accordance with the local potential and the socio-cultural conditions of their respective region.

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