

Biscuits Substitution with Tempe and Catfish Flour Increase Birth Weight of Infants Born from Mothers with Chronic Energy Deficiency

Sunarti
Public Health Faculty
Ahmad Dahlan University
Yogyakarta, Indonesia
sunarti@ikm.uad.ac.id

Mustofa Ahda
Faculty of Pharmacy
Ahmad Dahlan University
Yogyakarta, Indonesia

Ahmad Ahid Mudayana
Public Health Faculty
Ahmad Dahlan University
Yogyakarta, Indonesia

Diva Hanim
Magister of Nutrition
Sebelas Maret University
Surakarta, Indonesia

Kusnandar
Faculty of Agriculture
Sebelas Maret University
Surakarta, Indonesia

Mukhamad Angwar
Research Institute for Natural Tech.,
Institute of Sciences Gunung Kidul
Yogyakarta, Indonesia

Abstract—Chronic energy deficiency (CED) and anemia in pregnant women, is still a significant public health problem in Indonesia. CED on pregnant women the risk of low birth weight on newborn. Tempe and catfish are available for daily consumption and rich in protein and Fe but has been understudied to prevent low birth weight in pregnant mothers with CED Objective: The study aims to investigate the effect of biscuits substitution from mixed soybean fermentation (Tempe) and catfish flour in increasing birth weight of infants born from mothers with CED. Methods: This was quasi-experimental design involving 62 pregnant mothers in third trimester, but 10 mothers discontinued participation. At the follow-up study, the intervention group comprised 26 mothers, whereas the control group included 26 mothers. The intervention group received daily biscuits substitution from mixed tempe and catfish flour (70 grams) during 60 days, whereas the control group received daily supplementary feeding according to the national standard. The research subject was monitored until delivery. MUAC and hemoglobin were remeasured at the end of the intervention (60 days). The data from both groups compared using independent sample t-test. Results: The average of infant birth weight in the intervention group (3163.46; 414.622) was higher than the control group (2680.77; 521.551), $p < 0.001$. Biscuits substitution with soy bean fermented (tempe) and catfish flour increased the birth weight of infants born from mothers with CED and anemia. Therefore, these biscuits should be promoted to prevent low birth weight in babies born from mothers with CED and anemia.

Keywords—low birth weight, biscuit, chronic energy def

I. INTRODUCTION

The decline of the infant mortality rate was one point out of the 8 points agreed in MDGs in New York in 2000 [1], [2], of which the target achievement was in 2015. Low Birth Weight Infants (LBW) is less than 2500 grams having high risk of mortality and morbidity with the risk of death by 29% [3]. So far today, the prevalence of LBW in Indonesia is still high 10,2 % [4]. LBW infants with the condition are at risk of morbidity and mortality were higher compared with infants of normal birth [5]. The study in India showed the infant mortality rate 35 per 1,000 live births. The cause of death is

due to an infection, asphyxia and hyperbilirubinemia [6]. It can degrade the quality of human resources.

The cause of LBW is derived from pregnant woman factor, woman who chronic energy deficiency have risk LBW [7], [8]. Besides, there is another cause of LBW. It is the low socioeconomic status of the mother, resulting in a mother suffering from malnutrition and anemia during her pregnancy. The prevalence of anemia in pregnant mothers as a risk factor for LBW is still high reaching to 64% [9].

Stages of iron deficiency anemia from less reserves of iron, reduced iron in erythropoiesis and iron deficiency anemia is characterized by the decline in hemoglobin levels below normal [10]. Anemia in pregnant women that continues until the breastfeeding period will have an impact on the quality of breast milk. Iron levels in women with anemia are much lower compared to non-anemia mothers [11].

Besides Anemia, chronic energy deficiency (CED) in pregnant women, is still a public health problem in Indonesia. Basic health ministries of health research CED in 2013 showed the prevalence in pregnant women was 24.2%. Compared with basic health ministries of health research in 2007 this figure has increased significantly from 13.6 to 24.2% [4].

CED in pregnant women have a devastating effect on the mother and fetus to be born. CED impact on pregnant woman to her fetus, among others, the risk of LBW (low birth weight) infants were born. The babies are born in a state of low birth weight are at risk of mortality and morbidity are high compared with those born with normal weight [3]. LBW is also risk factor for stunting in children [12].

In addition to impact on the fetus, CED conditions also cause pregnant women to be disease susceptibility to infection and several other labor issues [13]. Boyolali is one of district in central java. Based on health profile of district Boyolali 2012 we know that LBW case in Boyolali is 300 babies (1,96%) from 15.111 babies total live births. The number of case increased compared to the previous year. Infant mortality rate (IMR) in 2012 was reported 11.30/1000 live births [14].

Mother mortality rate was reported 97.97/ live births. Maternal mortality is related to nutritional status, diseases status and other condition.

Improvement of nutritional status for pregnant women is very necessary to prevent babies with Low Birth Weight [15]. This study was aim to investigating the effects of biscuits substitution with tempe and catfish flour to increase birth weight of infants born from mothers with chronic energy deficiency. This biscuit per 100 grams contains energy of 496.81 Kcal, protein 17.74 grams, fat 25.13 grams, carbohydrates 49.92 grams, and Fe 8.57 grams [16]. Tempe and catfish are available for daily consumption and rich in protein and Fe but has been under studied to prevent low birth weight in pregnant mothers with CED.

II. METHOD

The research design applied in this testing of effectivity was Quasi-Experimental design [17]. Subjects in this study were third- trimester pregnant women with inclusion criteria, third-trimester pregnant women with chronic energy deficiency with MUAC less than 23,5 cm or anemia with hemoglobin level less than 12gr/dl, not currently suffering from chronic infection such as pulmonary TB. Subject taken from 5 community health centers in Boyolali district. The five primary health center namely Selo, Musuk 2, Karang Gedhe, Andong and Ngemplak. Selection of primary health care with purposif sampling based on prevalence of anemia and CED. Selection of subjects with randomly allocated. The subjects recruited in the study were 62 pregnant women consisting of 31 of the treatment group and 31 of the control group.

Subjects were divided into two groups: intervention group and control group. The intervention group was given biscuits substitution tempe and catfish flour 70 grams per day for 60 days. While the control group is given additional food for pregnant women in accordance with the national program. MUAC measurement was conducted by using MUAC tape [18]. The research subjects was monitored until delivery and MUAC were remeasured at the end of the intervention. Birth weight was measured using baby scales. Measurement was performed by a midwife. Until the follow-up, the subjects that could be analyzed were 52 pregnant women consisting of 26 treatment group and 26 control group. The main causes of drop-out subjects were giving birth outside the city and the data could not be recorded, the subjects consumed less than the dose and the birth forecast was longer than estimated. This research was approved by the committee for medical ethics in research, number 497/VIII/HREC/2014 in Sebelas Maret University.

III. RESULT AND DISCUSSION

TABLE I. THE CHARACTERISTICS RESEARCH SUBJECT BEFORE INTERVENTION

Variable	Intervention			Control		
	N	Mean	SD	N	Mean	SD
AGE (years)	26	24.35	6.609	26	22.88	6.333
MUAC (Cm)	26	21.35	1.084	26	21.56	1.224
Hb (Gr/dl)	26	9.684	1.491	26	10,296	0.831

TABLE II. THE DIFFERENCES OF MUAC AND HEMOGLOBIN LEVELS BEFORE AND AFTER INTERVENTION IN INTERVENTION GROUP

Variable	Intervention			Control		
	N	Mean	SD	N	Mean	SD
AGE (years)	26	24.35	6.609	26	22.88	6.333
MUAC (Cm)	26	21.35	1.084	26	21.56	1.224
Hb (Gr/dl)	26	9.684	1.491	26	10,296	0.831

a. t Testing

Based on Table 2 it can be seen that there is significant difference between Hb levels before and after treatment, and there is significant difference between MUAC before and after treatment with p value is 0.00 respectively.

TABLE III. THE DIFFERENCES OF MUAC AND HEMOGLOBIN LEVELS BEFORE AND AFTER INTERVENTION IN CONTROL GROUP

Control group	N	Mean Before	Mean After	T	p*
Hb (gr/dl)	26	10.29	10.85	-3.718	0,001
MUAC (Cm)	26	21.59	22.28	-2.986	0,006

a. t Testing

Based on Table 3 it can be seen that there is significant difference between Hb levels before and after treatment, and there is significant difference between MUAC before and after treatment with p value is 0.001 and 0.006 respectively.

TABLE IV. THE DIFFERENCE OF BIRTH WEIGHTMEAN BETWEEN IN THE INTERVENTION AND CONTROL GROUP

	Treatment Status	N	Mean	SD	p*
Baby Birth Weight (gram)	Intervention	26	3165,46	414,622	0,001
	Control	26	2680,77	521,551	

a. Testing

TABLE V. THE EFFECT OF BISCUITS SUBSTITUTION WITH TEMPE AND CATFISH AGAINST BABY BIRTH WEIGHT IN THE GROUP OF MOTHERS SUFFERING CHRONIC ENERGY DEFICIENCY

Variable	Regression Coeficient	P *value	CI
Constanta	2198,07	0,000	1783,1 - 2613,014
Biscuits substitution with tempe and catfish flour	482,652	0,001	3,694 – 226,238
N	52		
Adjusted R2	21,4 %		

a. Linier Regression

Table 5, shows the linear regression model. We can be seen that providing biscuits with substitution tempe and catfish flour can increase the baby's weight at 482.652.

The results show that there is an increase in the average level of hemoglobin and MUAC both before and after the treatment. This indicates that providing supplementary food to pregnant women with chronic energy malnutrition needs to be done to improve the nutritional status of pregnant women. The increase of MUAC was associated with

nutritional status improvement, while the increase of hemoglobin level was related to the presence of protein in the biscuit as a conveyance Fe in the body [19], [20]. It is in line with the research by which states that significant anemia is associated with protein-energy deficiency [21]. States that pregnant women consuming low protein less than 58% RDA have 1.6 times the risk of having infants with stunting at 12 months [22]. So that pregnant women with chronic energy malnutrition need to get extra food to improve nutritional status. Giving extra food that can increase body weight is needed for fetal growth and development [23].

Regression analysis shows that providing biscuits substitution with tempe and catfish flour influences the increase of baby birth weight. It is found that providing biscuits substitution with tempe and catfish flour biscuits contributes to the increase of baby weight as much as 482.5 grams. The result is consistent with the research by Prihananto 2007 stating that supplementary feeding to pregnant women increases the consumption of energy and protein in pregnant women [24].

This research is in line with Zulaidah who said that feeding in pregnant women in the third trimester had an effect on increasing the birth weight of babies [25]. Ahmadu, et al (2013) also mentions that maternal nutrition contributes to low birth weight in infants. LBW leading to risk of death in infants and children is still high in Indonesia, especially in poor families [26]. Nutrition based nutrition intervention approaches should be maintained because this approach has economic value, minimal risk of side effects and the long term usage. Nutrition of pregnant women is a crucial problem as it leads to fatal impact on the quality of human resources, so that the nutritional approach by emphasizing the supplementary feeding both locally and manufacturers is an important step to do.

In this study, the biscuits substitution with tempe and catfish flour are proven to contribute to the prevention of the incidence of low birth weight infants.

IV. CONCLUSIONS

Biscuits substitution with soy bean fermented (tempe) and catfish flour increased the birth weight of infants born from mothers with CED and anemia. Therefore these biscuits should be promoted to prevent low birth weight in babies born from mothers with CED and anemia.

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