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Kepok Banana Biscuits Increase The Size of Mid Upper Arm Circumference (MUAC) of Pregnant Women with Chronic Energy Deficiency (CED)

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ABSTRACT

Background: Good nutritional status is a fundamental factor in supporting the success of national development, particularly through improving the quality of human resources. Optimal nutrition in pregnant women is crucial for both maternal health and the growth and development of the fetus. Chronic Energy Deficiency (CED) in pregnant women is a common nutritional problem in Indonesia and has serious implications for maternal and neonatal health. Providing Supplementary Food (SF) made from local foods such as bananas can be an alternative to overcome CED. The purpose of this study was to determine the effect of Kepok Banana Biscuits on mid-upper arm circumference (MUAC) among pregnant women with chronic energy deficiency.
Methods: This study used a quasi-experimental design with a One-Group Pre-Test-Post-Test Design. The sampling technique in this study was proportionate random sampling with a minimum sample size of 30 respondents. Interventions are given for 14 days. The research instrument was a checklist of MUAC measurement results. Data analysis used the Wilcoxon test.
Results: The size of the MUAC of CED pregnant women before consuming Kepok banana biscuits revealed a median of 23 cm, with a minimum of 20 cm and a maximum of 23.5 cm. after consuming banana kepok biscuits showed a median of 23 cm, with a minimum MUAC of 20.5 cm and a maximum of 24 cm. before and after consuming banana kepok biscuits was obtained an average of 22.73 cm and increased to 22.83 cm.
Conclusion: There is a difference MUAC before and after consuming a kepok banana biscuit. Pregnant women are expected to increase their nutritional intake by consuming Kepok banana biscuits to prevent and overcome CED

Keywords : Biscuits; Chronic Energy Deficiency

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Background. Healthy, intelligent, and productive Indonesian human resources must be supported by good nutritional status to support the success of national development. Malnutrition during pregnancy and up to two years of age is a problem that requires serious attention. This period, known as the first thousand days of life (1000 FDL), is considered the golden period. Insufficient nutritional intake in pregnant women can lead to Chronic Energy Deficiency (CED), which can result in fetal death (miscarriage), premature birth, birth defects, low birth weight (LBW), and impaired fetal growth and development, particularly physical growth (Kemenkes RI, 2017).

Pregnant women who experience CED will have a negative impact on themselves and their unborn babies. Chronic energy deficiency during pregnancy can result in low birth weight (LBW) babies weighing <2500 g, which can disrupt the child's growth and development, premature births, and even sudden maternal or infant death (Kemenkes RI,2018)

CED is identified based on maternal mid-upper arm circumference (MUAC) measurements of less than 23.5 cm. Pregnant women with CED experience decreased blood

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volume expansion, resulting in insufficient blood pumping from the heart. This results in reduced blood flow to the placenta, resulting in abnormal placental size. This condition also leads to decreased nutrient distribution to the fetus, resulting in impaired fetal growth (Karima & Achmadi, 2018).

The 2018 Basic Health Research (Riskesdas) showed that the prevalence of CED risk in pregnant women remains quite high, at 17.3% (Kemenkes RI, 2018). The government has established a recovery supplementary feeding (SF) program to address CED (Jusmaniar, 2020). A total of 89.7% of pregnant women received supplementary feeding (SF) from the government (Kemenkes RI, 2018). One alternative to reduce the prevalence of KEK is to utilize local foods that are rich in calories as the main ingredient in FS.

Most research on supplementary feeding (PMT) for pregnant women with Chronic Energy Deficiency (CED) still focuses on processed foods based on nuts, milk, or relatively expensive commercial products. Research on the use of local food ingredients that are affordable, readily available, and meet local tastes is still limited. To date, studies on the effectiveness of banana-based biscuits on the nutritional status of pregnant women (e.g., changes in MUAC or body weight) have not been widely reported, even though bananas are a potential local food ingredient, rich in energy, vitamins, minerals, and fiber

Kepok bananas are a commercially available banana variety readily available throughout Indonesia. Kepok bananas, processed into biscuits, are made using low-protein ingredients to produce a crispier biscuit product (Ilmi, 2021). Biscuits are dry cakes with a long shelf life, a crispy, brittle, and dry texture, a brownish-yellow color, or a color that varies depending on the ingredients, and a fragrant aroma with a savory and sweet taste (Winarno, 2017). Biscuits are usually consumed as a morning and afternoon snack, easy to carry and practical to eat because of their dry nature and good packaging. The shelf life of biscuits is relatively long in PET (Polyethylene Terephthalate) packaging 2.14 months, in VMPET (Vacuum Metallized Polyethylene Terephthalate) packaging 4.73 months (Kusumawardani et al., 2018). The purpose of this study was to determine the effect of Kepok Banana Biscuits on mid-upper arm circumference (MUAC) among pregnant women with chronic energy deficiency

Methods. This study used a quasi-experimental design with a One-Group Pre-Test-Post-Test Design. The study was conducted in Kaliangkrik District, Magelang Regency, in March 2023. The population in this study were all 43 third trimester pregnant women in the Kaliangkrik area. The sampling technique in this study was proportionate random sampling with a minimum sample size of 30 respondents. To ensure the sample could represent the population, the researcher set inclusion criteria: mothers who were physically and mentally healthy, had a single pregnancy, had no problems/complications during pregnancy, did not avoid biscuits, and were willing to be respondents. The exclusion criteria were not completing the intervention according to research procedures and mothers experiencing problems during their pregnancy. The selection of respondents was carried out through lottery techniques (lottery), each member of the population was given a serial number, then the number was drawn randomly so that each member of the population had the same opportunity to be selected as a research sample. Interventions are given for 14 days. MUAC measurements are done before and after intervention. The research instrument was a checklist of MUAC measurement results using a new MUAC tape to measure the left upper arm circumference of third trimester pregnant women. Data analysis used the Wilcoxon test.

Result and Discussion. The research shows respondent characteristics known in the following table

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Table 1. MUAC Size of Pregnant Women with CED Before and After Consuming Kepok Banana Biscuits

Measurement results	Median	Min	Max
Before consuming Kepok banana biscuits	23	20	23,5
Before consuming Kepok banana biscuits	23	20,5	24

Chronic energy deficiency (CED) is a condition in which pregnant women suffer from long-term (chronic) nutritional deficiencies, which can lead to various health problems. Data analysis of the maternal mid-upper arm circumference (MUAC) before consuming Kepok banana biscuits revealed a median of 23 cm, with a minimum of 20 cm and a maximum of 23.5 cm. This indicates that many pregnant women still experience CED. This study's findings align with previous research, which showed that the average number of pregnant women experiencing CED (Sonia & Khodijah, 2017).

The cause of CED in pregnancy is due to food security, because the diversity of food consumption can be used as an indicator in determining the quality of food consumption, so that the more diverse food consumption, the more nutritional needs can be met (Marmi, 2013). The lack of fulfillment of nutritional needs for pregnant women is caused by the mother's low economic status and the mother's ignorance about maternal nutritional needs during pregnancy. While knowledge that is in the category of insufficient will impact energy and protein consumption, thus affecting nutritional status (Bakri, 2021).

Inadequate nutrition in pregnant women can lead to Chronic Energy Deficiency (CED), which can reduce muscle strength during labor, leading to fetal death (miscarriage), premature birth, birth defects, low birth weight (LBW), and impaired fetal growth and development, particularly physical growth (Ministry of Health, 2017). CED can be detected by measuring the mid-upper arm circumference (MUAC) of pregnant women, with a result of less than 23.5 cm. CED in pregnant women reduces blood volume expansion, resulting in insufficient cardiac output. Consequently, blood flow to the placenta is reduced, resulting in suboptimal placental size and reduced nutrient distribution to the fetus, leading to stunted fetal growth (Karima & Achmadi, 2018).

Data on the median MUAC of pregnant women after consuming banana kepok biscuits showed a median of 23 cm, with a minimum MUAC of 20.5 cm and a maximum of 24 cm. This indicates that, despite consuming banana biscuits, some pregnant women still experience chronic energy deficiency (CED). However, based on the maximum value, some pregnant women have experienced an increase in the MUAC, thus changing their status to non-CED.

Providing supplementary food to pregnant women is an intervention program for pregnant women suffering from Chronic Energy Deficiency (CED), aimed at meeting nutritional needs and improving their nutritional status. For families at risk of malnutrition, nutritional intervention through supplementary food is the primary priority, given that families are unable to provide sufficient food. Furthermore, providing supplementary food will serve as a means of education to develop families' ability to provide adequate food to meet the nutritional needs of pregnant women. After the supplementary food program ends, it is hoped that families and communities will gain knowledge about the uses of various food ingredients, how to process and prepare them, and how to familiarize pregnant women with their consumption. In addition to providing Supplementary Feeding (SF), pregnant women also receive information and education (IEC) on healthy foods to consume during pregnancy, sourced from locally available and affordable sources (eggs, nuts, cereals, spinach, kale, fish, tempeh, tofu, etc.). Providing nutritious and varied Supplementary Feeding (SF) and special meals for pregnant women with chronic energy deficiency (KE) aims to stimulate appetite and ensure adequate dietary intake.

Bananas are a high-calorie fruit. Kepok bananas are the most common commercial banana variety, making them readily available throughout Indonesia. Kepok bananas are

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processed into biscuits using low-protein flour, resulting in low-calorie biscuits. Protein is one of the essential components of food for pregnant women, as protein requirements during pregnancy depend on gestational age. Total fetal protein requirements during gestation range from 350 to 450 grams. In the first trimester, less than 6 grams per day are needed until the second trimester, with protein requirements increasing in the first trimester. At 20 weeks, the fetus begins to receive essential amino acids from the mother, but non-essential amino acids cannot be synthesized by the fetus (Proverawati, 2011). Protein in pregnant women supports the growth and development of the fetus, placenta, uterus, breasts, and increases maternal blood volume (Supariasa et al., 2016)

Table 2. Effect of Consuming Kepok Banana Biscuits on the Size of the MUAC of Pregnant Women with CED

Change	Results
Increase	**12**
Decrease	**0**
Constant	**18**
P value	**0.002**

The MUAC of pregnant women with chronic energy deficiency (CED) after consuming Kepok banana biscuits increased by 12 respondents, and remained unchanged at 18 respondents. Several factors can cause a pregnant woman's MUAC to remain unchanged, including daily dietary factors other than consuming banana kapok biscuits. This also affects nutritional status. If a mother maintains an unbalanced diet, the additional energy from biscuits may not be enough to increase the MUAC. Furthermore, each pregnant woman has a different metabolism, health condition, physical activity level, and initial nutritional status. These different responses can result in the majority experiencing no change in MUAC

The analysis showed a difference in the MUAC of pregnant women with CED before and after consuming Kepok banana biscuits. This study's findings echo those of previous research, which showed that processed bananas into biscuits effectively increase the weight of pregnant women with CED.

Bananas are a leading Indonesian commodity with the potential to support national food security. Bananas are a popular fruit due to their high nutritional content and versatility. Furthermore, they are affordable and can be consumed fresh or processed. Bananas are a fruit rich in antioxidants, essential vitamins and minerals, as well as essential daily fiber. Bananas are a complex and simple carbohydrate, making them a valuable source of energy to boost immunity. One way to utilize Kepok bananas is by making biscuits. Biscuits are a popular snack among Indonesians. The high consumption of biscuits provides added value to this food (Kusumawardani et al., 2018).

Biscuits made from kapok bananas are rich in carbohydrates and protein, making them excellent for accelerating weight gain. Research by Hulu (2022) indicates that the carbohydrate content of banana flour is 85.25%, while the protein content is 5.58%. Carbohydrates provide energy for the body. One gram of carbohydrates yields 4 kcal. Some of the carbohydrate in the body circulates as glucose for immediate energy needs, some is stored as glycogen in the liver and muscle tissue, and some is converted into fat for later storage as energy reserves

Bananas were chosen for their several advantages, including their pleasant taste and aroma, high carbohydrate, protein, and fat content, and rich in vitamins and minerals. The pleasant aroma of bananas will reduce boredom and encourage pregnant women to continue consuming Supplementary Feeding (SF) biscuits. Carbohydrates, protein, and fat are the primary sources of energy. This provides additional energy and protein in addition to those already contained in Supplementary Feeding (SF) biscuits. This increased energy and protein intake is what drives weight gain in pregnant women with CED.

Conclusion and Suggestions. There is an effect of consuming Kepok banana biscuits on

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the MUAC size of CED pregnant women. Pregnant women are expected to increase their nutritional intake by consuming Kepok banana biscuits to prevent and overcome CED.

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