

## Local Snacks For Pregnant Women

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**Abstract**—Pregnancy is a very important period considered related to the fetus and additional nutrition intake. Additional nutrition intake can be fulfilled from the highly nutritious snacks. The objective of the research is to determine nutrient content (energy, protein and iron) and snacks preference level of the local foods. The research methods used the ingredients from local foods consist of green beans, purple sweet potatoes and potatoes. Energy content was analyzed by bomb calorimeter, protein with micro-kyeldahl and iron with a colorimeter. Favorite level was tested with test favorite. 1) Snacks first trimester of pregnant women is made from green beans ingredients energy consist of 216-646 kcal, protein 8.0 to 27.4 g, iron 3.3 to 6.3 mg. 2) Snacks of second trimester pregnancy women is made from purple sweet potato with contain energy 448-651 kcal, protein 3.1 to 28.1 g, iron 6.9 to 8.1 mg. 3) Snacks of third trimester with the basic ingredients of potatoes contain energy 443-963 kcal, protein 7.8 to 32.1 g, iron 4.8 to 8.6 mg. 4) All kinds of snacks is preferred by pregnant women. It can be concluded that seven types of snacks for pregnant women with green beans, purple sweet potato and potato are included in high-energy snacks, but it is needed the addition of animal food to improve the content of protein and iron.

**Keywords**— energy, local foods, pregnant women, protein, snacks

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### I. INTRODUCTION

The pregnancy period is the period that determine the quality of human resources in the future; because the development of the child is determined by conditions of fetus in the womb [1]. The health condition of the majority of pregnant women are anemic and the risk of KEK. Based on the results of research carried out by Setyaningsih, Fathonah and Kuswardinah in Semarang, they found maternal anemia prevalence of 48.7%, with details of the prevalence in the city clinic of 8% and in the suburban clinic of 54.3%. The mean hemoglobin levels of city clinic is 11.1 mg/dl and 11.2 mg/dl in suburban clinic. The prevalence of KEK maternal risk is 25.7%, 21.9% in city clinic and of 30.0% in suburban clinic [2]. This number is higher than the prevalence of anemia in nationwide pregnant women in 2001 which was 40%, while the risk of KEK 16.7% on WUS. WUS with the risk of KEK tends to give birth LBW infants [1]. This is supported by Anwar. LBW is closely associated with malnutrition during pregnancy [3].

In order to a mother can give birth to healthy babies, mothers should pay attention to nutrition and maintain the healthy [4]. Necessary nutrition of pregnant women is higher than before pregnancy. Additional energy in pregnant women is based on the energy requirements for growth of the fetus, uterus and placenta, energy reserves for maternal and breastfeeding. Additional protein is estimated based on the adequacy number of protein per kg of body weight which is 1.1 grams/kg/day. Additional energy during trimester 1 is 190 kcal, while during trimester 2 and 3 are 300 kcal. The additional protein during pregnancy is 12 g, while additional iron is needed in trimester 2 is 9 mg, and 13 mg in trimester 3; during trimester 1 it does not require additional iron [5]. These additional nutrients can be met from food or snack.

Snack is an additional food that pregnant women have to consume, in addition to the main food consumed before. The requirements of snack for pregnant women are 1) rich of nutrients, 2) made from natural ingredients, without any food additives such as flavorings, preservatives, and food colorings [6]. Good snack 1) is a source of energy, protein, various vitamins and minerals, 2) does not contain sweeteners, colorings and preservatives that are not in line with the rules [7].

Snacks that are sold in some places (markets, shops, supermarket, roadside) are nothing devoted to pregnant women. Making snacks for pregnant women is expected to meet the additional nutrient needs that are needed during pregnancy. The ingredient used are mug beans that have a high protein content, purple sweet potatoes that contain a lot of anthocyanin that acts as antioxidants, and potatoes that have special texture and flavour and can help reduce headache disorders in pregnant women.

## II. INGREDIENT AND METHOD

The ingredients used to make this snack are mug beans for the first trimester pregnant women, purple sweet potato for trimester 2 pregnant women, and potatoes for trimester 3 pregnant women. Additional ingredients to make snack used as a source of protein and iron are beef, chicken, eggs, milk, fish, and a variety of vegetables such as carrots, peppers, and beans.

The analysis of these snacks is nutrient contents (energy, protein and iron) and the acceptance testing of preference of pregnant women [8]. The energy content is analyzed by bomb calorimeter, the protein content by the method of micro kyeldahl and iron were analyzed by colorimeter at length wave 480 nm [9].

Assessment scores of preference test range from 5 for *really like* to 1 for *dislike*. The determination of the level of preference criteria is based on the score obtained of 5 criteria ranging form *do not like* to *really like*; they are listed in Table 1 below.

Table 1. Score Range and Category of Preference Level

No.	Score Range	Category of Preference Level
1.	4,3 - 5,0	Really Like
2.	3,5 - 4,2	Like
3.	2,7 - 3,4	Neutral
4.	1,9 - 2,6	Quite Dislike
5.	1,0 - 1,8	Dislike

## III. RESEARCH FINDINGS

Snacks for pregnant women are needed to meet the additional nutrient needs so that the growth of fetus is normal. Snacks of pregnant women during trimester 1 are made of mug beans. Snacks for pregnant women during trimester 1 that are made of mug beans have quite high nutrients, even very high for mug bean chicken nugget. By consuming 80 g of milkshake, 40 g of nugget, 70 g of pudding, it has met the additional energy (180 Cal). The need of additional protein (12 g) can be met by consuming 100 g milkshake, 40 g nugget, and 150 g pudding. The iron content is quite high, between 3.3 - 6, 3 mg.

Table 2. Nutrient Contents of Snack for Pregnant Women in Trimester 1

Type of nutrient	Nutrient Contents/100 g		
	Mug Bean Chocolate Milkshake	Mug Bean Chicken Nugget	Mug Bean Pudding
Energy (Cal)	216	646	269
Protein (g)	11,7	27,4	8,0
Iron (mg)	3,3	6,3	4,2

The nutrient contents of snacks for pregnant women in trimester 2 is higher than in trimester 1; protein contained in pancake of purple sweet potatoes. To meet the needs of additional energy (300 Cal), it is needed to consume about 50 g of purple sweet potatoes Filloand Pastel with purple sweet potato topping and meat ragout filling, while for purple sweet potatoes Pancake is 75 g. Additional needs of protein (12 g) need 50 g fillo, 40 g pastel, and quite more for pancake, i.e. 400 g. Additional needs of iron in trimester 2 is 9 g, thus it can be met by 125 g fillo and pancake, in addition to 100 g pastel. The more complete of nutrient contents of snacks for pregnant women in trimester 2 are presented in Table 3.

Table 3. Nutrient Contents of Snack for Pregnant Women in Trimester 2

Type of nutrient	Nutrient Contents/100 g		
	Purple sweet potatoes Fillo	Pastel with purple sweet potato topping and meat ragout filling	Purple sweet potatoes Pancake
Energy (Cal)	568	651	448
Protein (g)	21,0	28,1	3,1
Iron (mg)	7,0	8,1	6,9

Analysis of nutrients, especially energy and very high protein found in potato waffle sandwich snack. If pregnant women consume about 30 g potato waffle sandwich, they have met the additional needs for energy (300 Cal) and protein (12 g). Energy needs can be met by approximately 70 g dumplings and 50 g Panada potato with mackerel ragout filling, while the necessary to meet the needs of protein, pregnant women need approximately 75 g dumplings and 150 g san dumpling. The iron contents in snacks for pregnant women in trimester 3 are lower than the need for additional iron i.e. 13 g, so it requires a fair amount of consumption between 150-270 g.

Table 4. Nutrient Contents of Snack for Pregnant Women in Trimester 3

Type of nutrient	Nutrient Contents/100 g		
	Potato waffle sandwich	Dumpling with potato salad filling	Panada potato with mackerel ragout filling
Energy (Cal)	963	443	558
Protein (g)	32,1	15,8	7,8
Iron (mg)	4,8	5,4	8,6

The level of preference of all snacks for pregnant women in trimester 1 at *like* level with mean 3.6 to 4.0. It shows that pregnant women like the snacks provided. The complete of preference level of snack for pregnant women for each trimester is presented in Table 5.

Table 5. The Level of Preference of Snacks for Pregnant Women in Trimester 1 Ingredient: Mug Bean

Preference Aspects	Mean of Preference Level		
	Mug Bean Chocolate Milkshake	Mug bean chicken nugget	Mug bean pudding
Colors	3,8	3,7	3,5
Textures	4,0	3,9	3,7
Aromas	3,7	4,1	3,6
Tastes	3,8	4,1	3,7
Mean of all Aspects	3,8	4,0	3,6
Category	Like	Like	Like

When those snacks for pregnant women are compared and viewed from all aspects of the most preferred, mug bean chicken nugget is the most preferred in which the highest scores are in aroma and taste aspects with mean 4.1. While for the color and texture aspects, mug bean milkshake is more preferred to nugget and pudding.

The research result that is quite similar to the score that is quite higher occurred in the preference level of snacks for pregnant women in trimester 2 with *like* category, and its variance between 3.8 – 4.2. More complete results are presented in Table 6. The most preferred snack for pregnant women in trimester 2 is pastel with purple sweet potato filling that has interesting shape and color, and it can be seen in the outermost of graphic (Figure 4). Purple sweet potato fillo and pancake have preference scores that are quite similar to all aspects of preference.

Table6. The Level of Preference of Snacks for Pregnant Women in Trimester 2 Ingredient: Purple Sweet Potatoes

Preference Aspects	Mean of Preference Level		
	Purple sweet potato fillo	Pastel with purple sweet potato topping and meat ragout filling	Purple sweet potatoes Pancake
Colors	3,9	4,2	3,9
Textures	3,9	4,1	3,8
Aromas	3,8	4,1	3,7
Tastes	4,0	4,2	3,8
Mean of all Aspects	3,9	4,2	3,8
Category	Like	Like	Like

The preference levels of snacks for pregnant women in trimester 3 are potato waffle sandwich, dumpling with potato salad filling, and panada potato with mackerel ragout filling which have quite similar preference level at 3.7 and 3.8 with *like* category (Table 7). This result shows that snacks in trimester 3 are well acceptable by pregnant women.

Table7. The Level of Preference of Snacks for Pregnant Women in Trimester 3 Ingredient: Mug Bean

Preference Aspects	Mean of Preference Level		
	Potato waffle sandwich	Dumpling with potato salad filling	Panada potato with mackerel ragout filling
Colors	3,8	3,8	3,8
Textures	3,8	3,8	3,7
Aromas	3,7	3,8	3,7
Tastes	3,9	3,9	3,7
Mean of all Aspects	3,8	3,8	3,7
Category	Like	Like	Like

If scores of preference level that are quite similar are drawn in radar graphic, the most preferred snack is dumpling with potato salad filling that is shown by outermost graphic. Radar graphic is shown in Figure 5 below. Aroma aspect of those three snacks have the lowest score when they are compared to the aspect of taste, color, and texture.

#### IV. DISCUSSION

Snacks in trimester 1 has good nutrient contents, even mug bean chicken nugget has very high nutrients. Their preference levels are in *like* category, moreover the observation held in Miroto Clinic, pregnant women are very like nugget. These results indicates that snacks produced meet the good criteria in terms of nutrient contents and the acceptance of society. If they are reviewed of the energy contents and iron, they have met the whole needs of additional nutrients. While, the needs of protein can be met about 67% in mug nugget pudding, moreover milkshake and nugget can meet 97.5% and 228% of additional needs of pregnant women. Pregnant women in trimester 1 have not needed the additional of iron, although those snacks have quite high iron. The high nutrient contents are resulted from the nutrient contents of ingredients, i.e. mug bean and other ingredients such as chicken and milk that have high nutrient as well. Mug bean has 116 kcal of energy, 7.7 g of

protein, and 2.5 mg of iron [10]. Consuming beans while having pregnant will not affect an allergy. The result of research carried by Maslova, Granström, Hansen, Petersen, Strøm, Willett, and Olsen did not suggest that women should decrease peanut and tree nut intake during pregnancy; instead, consumption of peanuts and tree nuts during pregnancy might even decrease the risk of allergic disease development in children [11]. Consuming enough beans ( $\geq 30$  times/month) is a protective factor of anemia [12].

The similar results are also found at snacks for pregnant women in trimester 2, with purple sweet potatoes as the ingredients. The energy and protein contents inside have met the needs of additional nutrient, exceptional for the protein contents of purple sweet potato pancake. The iron contents of the snacks are quite high, although, they do not meet 100% of the needs. This is in line with the opinions from Khomsan and Sutomo stating that food intakes during pregnancy are generally difficult to meet the needs of iron. Therefore, iron is recommended to consume in the form of blood booster supplementary tablets or iron tablets [4].

Purple potato has a high carbohydrate content but also has 54 glycemic index and high fibers which are very good for pregnant women in order not to increase the blood glucose level immediately. Besides, the purple sweet potato has antioxidant compound especially anthocyanin that has very positive function. The results of Research and Development Center for Food Crops Research and Development of Agriculture, shows that anthocyanin is beneficial to health because it can function as an antioxidant, anti-hypertensive, and prevention of liver dysfunction, coronary heart disease, cancer and degenerative diseases, such as atherosclerosis. Anthocyanin is also capable of blocking rate of cell destruction caused by free radicals nicotine, air pollution, and other chemical substances. Anthocyanin plays a role in preventing the onset of aging, memory decline and dementia, polyp, gout, heartburn sufferers (stomach acid). In addition, anthocyanin also has the ability to lower blood glucose/anti-hyperglycemic [13]. More over, purple sweet potato contains probiotic that is a compound that can stimulate the growth of good bacteria, such as Lactobacilli and Bifidobacteria group [7]. Sweet potato is a food that has low fat and contains a lot of vitamins E [14].

Snacks for pregnant women in trimester 3 has very high energy and protein contents, and also quite high iron content. Consuming these snacks will contribute significant nutrient intake in order to support maternal health and fetal growth in the womb. The results of the study on snack consumption in adolescents who are pregnant, postpartum teens showing who ate breakfast six to seven days / week consumed 1.197 fewer kilocalories per week from sweet and salty snacks, 1.337 fewer kilocalories per week from sweetened drinks, and had a lower BMI. Compared to those who ate breakfast fewer than two days per week ( $P < 0.05$ ) [15]. Additional energy in pregnant women is based on the energy requirement for the growth of the fetus, uterus and placenta, maternal energy reserves and breastfeeding [5]. Growth of cells, tissues, and organs of the fetus depends on the intake of oxygen and vital nutrients from the mother. If both of these are not met, then the fetus will experience a slow cell growth. Growth delay was mainly seen in tissues or organs that are in an important period of growth. Health and nutrition status of pregnant women at the time of conception and during pregnancy are essential for the health and growth of the fetus. The rapid growth of the fetus affect the health and ability to fight diseases in the future [16].

Potatoes that are used as the ingredients of snacks for pregnant women in trimester 3 have a soft texture and tender, with a distinctive flavor when cooked so it is preferred for pregnant women. Even in the test held in Miroto Clinic, this snack is very popular. This happens because the snack is given shortly after being cooked, so it is still warm. This is in accordance with the opinion by Pujimulyani [17] who says that when potatoes are cooked will cause soluble fractions increase and become soft and have a distinctive flavor of potato. Potatoes are very good to consume by pregnant women, as they have the benefit to help relieve headaches [18]. These headaches are experienced by many pregnant women or commonly occurs during pregnancy. Headaches are caused by dilation of blood vessels in the brain, the hormones, stress or tension in the muscles of the head and neck that are caused by the wrong posture during pregnancy [16,19].

Local food ingredients that are used to make snacks for pregnant women are good source of carbohydrates. The requirements of good quality carbohydrates are 1) a low glycemic index value (not too quickly converted into blood glucose within two hours). The glycemic index of mug beans, purple sweet potatoes are between 30-50, while potatoes 80-100, 2) have a fiber content (as a means of speed control that is converted into blood glucose), 3) have a high antioxidant capacity (preventing free radicals as the body waste that does metabolism). Beta carotene and polyphenols are in mug beans, anthocyanin is in purple sweet potatoes, and chromogenic acid [20] is in potatoes; 4) alkalis (organ to be damaged by the intake of acidic foods). Mug beans, sweet potatoes and potatoes provide carbohydrates including alkaline ash [21].

If pregnant women consume 100 g/day of snacks for pregnant women in trimester 1, trimester 2, and trimester 3, it means that the pregnant woman have consume high-energy foods, except milkshake (216 kcal) and puddings (269 kcal). However pudding is made of jelly that contains high fiber which is very good for pregnant women. According to the Nutrition Labeling and Education issued by the Codex Alimentarius in Astawan, it is said that foods are called high-energy foods if these foods can provide the minimum energy of 300 kcal per serving [7]. Consuming high-energy foods can help overcome the risk of chronic energy deficiency in pregnant women. In the first year of the study, it was found the risk of KEK in Semarang that is still high. The prevalence of KEK risk for maternal is 25.7%, which is 21.9% in city clinics and 30.0% is in suburban clinics [2].

If those snacks are compared to the existing foods like *klepon* (214 kcal energy and protein 1.2 g), *keroket* (292 kcal and 4.8 g protein), fried bananas (220 kcal energy and protein 2.3 g), *risoles* (energy 233 kcal and 5.2 g protein), *bakwan* (energy 250 kcal and 4.2 g protein) [7], the contents of snacks for pregnant women generally have higher nutrient contents. In addition, the snacks that are made by self at home will be assured of cleanliness (hygiene) and freshness so that these snacks are healthier.

The snacks that are salty such as mug bean chicken nugget, purple sweet potato fillo, pastel with purple sweet potato topping and meat ragout filling, dumpling with potato salad filling and panada potato with mackerel ragout filling are preferred by pregnant women to sweet snacks. This is in accordance with the research carried out by Skinner, Pope, and Carruth[22] during pregnancy, but not after, salted peanuts, chips, and crackers were preferred ( $p = 0.0003$ ,  $0.0001$ , and  $0.03$ ) over the unsalted/low-salt products.

The research about formula foods for children under five-year old using various of fish and sea weed showed that four kinds of formulas are accepted by panelists, with the protein score is higher than soybean, and contain folate acid, vitamin A, and zinc that can meet 70% - 110% of nutrient needs for children under five-year old [23].

## V. CONCLUSION AND SUGGESTION

Snacks for pregnant women:

- 1) Snacks in trimester 1 with mug beans as the ingredients, they are mug bean chocolate milkshake, mug bean chicken nugget, and mug bean pudding, contain 216 – 646 kcal of energy, 8.0 – 27.4 g of protein, and 3.3 – 6.3 mg of iron.
- 2) Snacks in trimester 2 with purple sweet potatoes as the ingredients, they are fried sweet potato fillo, pastel with purple sweet potato topping and meat ragout filling, and purple sweet potato pudding, contain 448 – 651 kcal of energy, 3.1 – 28.1 g of protein, and 6.9 – 8.1 mg of iron.
- 3) Snacks in trimester 3 with potatoes as the ingredients, they are potato waffle sandwich, dumpling with potato salad filling, and Panada potato with mackerel ragout filling, contain 443 – 963 kcal of energy, 7,8 – 32,1 g of protein, and 4,8 – 8,6 mg of iron.
- 4) All type of snacks are preferred by pregnant women.
- 5) Seven kinds of snacks have met the requirements of high energy snack per 100 g, except mug bean chocolate milkshake and mug bean pudding. However, it still needs to add other ingredients that contain protein and iron such as fish and *tempe* (*fermented soybean cake*), or changing chicken to fish that has higher protein and iron.

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