Journal of Medicinal and Chemical Sciences 7 (2024) 822-829

Journal of Medicinal and Chemical Sciences

Journal homepage: http://www.jmchemsci.com/

Original Article

The Effect of Providing Food of *Tinutuan Tinu Key* on the Anthropometric Nutritional Status and Hemoglobin Levels of Pregnant Women

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ARTICLEINFO

Article history

Received: 2024-03-15
Received in revised: 2024-05-10
Accepted: 2024-05-11
Manuscript ID: JMCS-2404-2492
Checked for Plagiarism: **Yes**
Language Editor Checked: **Yes**

DOI:10.26655/JMCHEMSCI.2024.6.5

KEYWORDS

Health cadres
Tinutuan
Nutritional status
Pregnant women
Anemia
Hemoglobin

ABSTRACT

Objective: This study aimed to analyse the effect of providing food of *tinutuan tinu key* on the anthropometric nutritional status and hemoglobin levels of pregnant women.
Methods: This work used an experimental method without a control group. The population was all pregnant women at the Wori Community Health Center, Wori Sub District, North Minahasa Regency, totaling 53 people. The providing food of *tinutuan tinu key* model was provided for 30 days. Pregnant women receive assistance from health workers four times a month and *tinutuan tinu key* once a day for 30 days. The main variables of the study were mid-upper arm circumference (MUAC) and hemoglobin levels. Data analysis was the Paired T-Test with a significance level of $p < 0.05$.
Results: The results of the study revealed that the average MUAC before providing food of *tinutuan tinu key* was 25.77 and after was 27.00 with a sig value (2-tailed) of 0.000. Aside from that, it was discovered that the average score for hemoglobin levels before providing food of *tinutuan tinu key* was 10.36 and 11.26 after with a sig value (2-tailed) of 0.000.
Conclusion: The providing food of tinutuan tinu key has the potential to prevent chronic energy deficiency and anemia in pregnant women.

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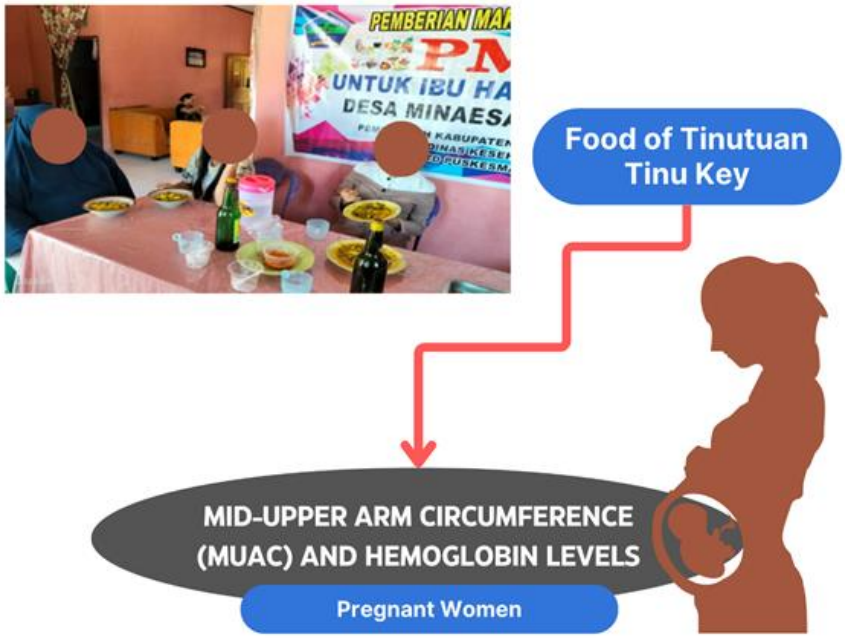
GRAPHICAL ABSTRACT



Introduction

Pregnant women with low nutritional intake and infectious diseases are more likely to have babies with Low Birth Weight (LBW) and/or babies with body lengths that are below standard [1]. Not only during childbirth, but also during pregnancy, because the period from when a child is in the mother's womb until it is two years old (1,000 HPK) is crucial in supporting normal child growth and development [2]. The nutritional status of pregnant women will have an impact on children, such as stunting [3], which is the condition of failure to grow in children under the age of five due to chronic malnutrition, particularly during the first 1,000 days of life (HPK). Problems with nutritional status in pregnant women are caused by food intake due to a lack of knowledge about the uses of these foods [4]. In various countries, including Indonesia, there are various nutritional programs and interventions designed to help pregnant women maintain and improve nutritional status, namely: 1) Provision of Supplementary Food given to pregnant women and toddlers who experience malnutrition. In Indonesia, there are Technical Instructions for the Provision of Supplementary Food Made from Local Food for Toddlers and Pregnant Women which are used as a reference in implementing the PMT program; 2) Iron supplementation; and 3) Nutrition Counseling and Education. *Tinutuan* is a local food that is familiar to culinary fans in Indonesia and the world. *Tinutuan*, which is popularly known as "Manado porridge", is not just a food consisting of porridge and various types of vegetables as the main human need, but is a nutritious food. Grace Langi's research (2020) illustrates that the tinutuan modification, namely the Tinu Key model, is preferred by pregnant women. Health cadres are volunteers in the health sector who are directly selected by and from the community whose job is to help in the development of public health [5].

Health cadres, also known as village health promoters or prokes, help to develop community health by working alongside health workers and community mobilizers. The research aimed to analyse the effect of providing food of *tinutuan tinu key* on the anthropometric nutritional status and hemoglobin levels of pregnant women at the Wori Community Health Center, Wori Sub District, North Minahasa Regency.

Materials and Methods

This work uses an experimental method without a control group, carried out from July 2022 to November 2022, at the Wori Community Health Center, Wori District, North Minahasa Regency. The research population was all pregnant women at the Wori Health Center, Wori District, North Minahasa Regency, totaling 53 people. The variables tested were the Independent variables: Health Assistance and tinutuan tinu key model and the dependent variable was the nutritional status of pregnant women. Developing nutrition education media, beginning with generating nutrition material for use by Health cadres in providing health assistance, is part of the preparatory stage. Next, providing food of *tinutuan tinu key*, which is made with eight different ingredients (gedi, yellow pumpkin, potatoes, cassava leaves, spinach, basil, and lemongrass). In this study, pregnant women received the intervention, namely providing food of *tinutuan tinu key* and were then accompanied by health cadres. Table 1 indicates that one serving of *tinutuan tinu key* (260.5 grams) contains around 10.63% calories, 10.53% protein, 3.21% fat, 13.87% carbohydrates, 24.12% fiber, 35.42% calcium, 74 .64% phosphorus, 15.56% iron, 39.25% sodium, 28.59% potassium, 39.17% zinc, 50.00% vitamin A, 28.57% vitamin C, 21.67% vitamin B1, and 76.71% folate of the nutritional needs of pregnant women (aged 20-49 years, trimester 1-3). Pregnant women receive assistance from health workers four times a month and *tinutuan tinu key* once a day for 30 days. Before beginning the intervention, researchers took initial measurements of all dependent variables, including pregnant women's nutritional health.

Table 1: Nutritional composition and percentage of contribution to nutritional intake of 1 portion food of tinutuan tinu key

No.	Food	Food weight (g)	Energy	Protein	Fat	Carbohydrate	Fiber	Calcium	Phosphor	Iron	Natrium	Potassium	Zinc	Thiamine	Riboflavin	Niacin	Vitamin C
			Kcal	g	g	g	g	g	mg	mg	mg	mg	mg	mg	Mg	mg	mg
1	Small gedi leaves	30	18.3	0.96	0.21	3.12	1.02	126	21	0.51	6	15	0.42	0.12	0.09	0.87	3.3
2	Yellow pumpkin	200	102	3.4	1	20	5.4	80	360	1.4	560	440	3	0.4	0	0.2	4
3	Potato	200	124	4.2	0.4	27	1	126	116	1.4	14	792	0.6	0.18	0.2	2	42
4	Cassava leaves	30	9.3	1.11	0.18	1.44	0.48	48	15	0.78	3.9	4.2	0.6	0.006	0.03	0.51	10.2
5	Spinach	30	6.9	0.36	0.18	1.11	0.33	45	10.5	0.15	4.8	92.52	0.09	0.006	0.03	0.27	5.7
Total Nutrition 1 Serving			260.5	10	2	52.7	8.2	425	522.5	4.2	588.7	1343.7	4.7	0.7	0.4	3.9	65.2
Nutritional Needs of Pregnant Women (aged 20-49 Years, Trimester 1-3)			2450	95	62.3	380	34	1200	700	27	1500	4700	12	1.4	1.4	18	85
Percentage of Contribution to Nutritional Intake of 1 Portion			10.63	10.53	3.21	13.87	24.12	35.42	74.64	15.56	39.25	28.59	39.17	50.00	28.57	21.67	76.71

Characteristic variables of pregnant women including age, gestational age, occupation, and income were collected using a characteristics questionnaire with 1 measurement at the start of the study. One way to determine anthropometric nutritional status in pregnant women is by measuring the mid-upper arm circumference (MUAC) [6]. MUAC was divided into two categories according to the UNICEF 2018 guidelines (Chronic Energy Deficiency: <23.5 cm and normal: 23.5 cm) [7]. The process of measuring hemoglobin levels involves taking capillary blood samples from respondents, and then examining them using a Hemoglobin meter. Anemia in pregnancy is confirmed if the hemoglobin (Hb) level is <11 g/dL and normal if the hemoglobin (Hb) level is > 11 g/dL [8]. The data that has been obtained will be analyzed using the Paired T-Test to determine the differences in pre and post-research variables with a significance level of $p < 0.05$.

Results and Discussion

Table 2 presents that the highest age of respondents is 21-34 years old with a total of 38 people (71.1%), the highest gestational age is in the third trimester with a total of 42 people (79.2%), the highest level of education is at the high school/vocational school level with the number 35 people (66.0%), the most jobs are in household workers with 34 people (64.2%), and the highest income is IDR. 1,500,000-IDR. 2,500,000 as many as 18 people (34.0%).

According to Table 3, the highest nutritional status is discovered before administration, namely normal 41 (77.4%) and increased to 46 (86.8%) after giving the tinu key. The highest hemoglobin level was detected before administration, namely the low category, 29 (54.7%), and after administration, it raised to the normal category, 32 (60.4%) of the 53 respondents.

Table 2: The characteristics of pregnant women

Characteristics	n	%
Age		
<20 years old	12	22.6
21-34 years old	38	71.1
>35 years old	3	5.7
Gestational Age		
Trimester I	1	1.9
Trimester II	10	18.9
Trimester III	42	79,2
Education		
Elementary School	4	7.5
Junior High School	11	20.8
Senior High School/Vocational High School	35	66.0
College	3	5.7
Occupation		
Housewife	34	64.2
Civil Servant	1	1.9
MRT	16	30.2
Private Employee	2	3.8
Income		
>IDR. 3.500.000	16	30.2
IDR. 2.500.000 - IDR. 3.500.000	12	22.6
IDR 1.500.000 - IDR 2.500.00	18	34.0
<IDR 1.500.000	7	13.2
Total	53	100

Table 3: The frequency distribution of pregnant women's nutrition status based on Mid-Upper Arm Circumference (MUAC) and hemoglobin level before and after the intervention

Nutrition Status	Before		After	
	n	%	n	%
Nutrition Status Based on Mid-Upper Arm Circumference (MUAC)				
Normal	41	77.4	46	86.8
Chronic Energy Deficiency (CED)	12	22.6	7	13.2
Hemoglobin Level				
Low	29	54.7	21	39.6
Normal	24	45.3	32	60.4
Total	53	100.0	53	100.0

Table 4: The effect of giving tinu key on the anthropometric nutritional status of MUAC and hemoglobin levels of pregnant women

Variable		Mean	t	Sig. (2-tailed)
The Nutrition Status Based on MUAC	Before	25.77	-4.655	.000
	After	27.00		
Hemoglobin Level	Before	10.36	-6.825	.000
	After	11.26		

Table 4 shows that the results of statistical analysis using the paired sample t-test showed that the average value of nutritional status before providing food of *tinutuan tinu key* was 25.77 and after providing food of *tinutuan tinu key*, it increased to 27.00. Based on the sig. value (2-tailed) of 0.000 < 0.05, it can be concluded that there is a difference between nutritional status in the data before and after the intervention. The average level for hemoglobin levels before providing food of *tinutuan tinu key* was 10.36 and after providing food of *tinutuan tinu key* was 11.26. Based on the sig. value (2-tailed) of 0.00 < 0.05, it can be concluded that there is a difference between hemoglobin levels in the data before and after the intervention.

According to the research findings, statistical analysis utilizing the paired sample t-test revealed that the mean value of nutritional status after providing food of *tinutuan tinu key* was 27.00 and the hemoglobin level after providing food of *tinutuan tinu key* was 11.26. Based on the sig. (2-tailed) value of 0.000<0.05, it can be inferred that administering tinu key to pregnant women has a substantial effect on their nutritional status and hemoglobin levels.

The results of the work carried out are in line with research conducted by Losu *et al.* (2015), it was found that there was a significant effect of 0.000 (p<0.05), meaning that there was a significant effect after giving the *traditional tinutuan* menu on hemoglobin levels in pregnant women in the work area Bahu Community Health Center, Manado City [9]. In addition to taking iron supplements, pregnant women should consume the traditional Tinutuan menu, which is high in macronutrients and micronutrients. The *tinutuan 8 "tinu key"* model is assessed from the nutritional composition. This 8 "tinu key" model plays a more important role in providing energy and another nutritional intake for pregnant and breastfeeding mothers than other tinutuan models. The initial tinutuan model is generally known for only three local food ingredients, even though there are many kinds and quantities of vegetables in Indonesia [5]. Utilizing local food sources of animal protein in preventing stunting can increase intake of protein, iron, zinc, and calcium [10]. This can aid iron absorption in pregnant women, allowing mothers to avoid iron anemia. Low hemoglobin levels in pregnant women can be caused by a variety of causes, one of which is poor nutritional status [11].

Nutritional issues in pregnant women can lead to poor nutritional status. Pregnant women frequently experience CED and anemia. CED during pregnancy inhibits fetal growth, increasing the chance of LBW [12]. According to

Madiun's research, pregnant women who have CED have an 8.24 times higher risk of having babies with LBW. An anthropometric examination can be used to examine the nutritional condition of pregnant women, for example, by assessing body weight, height, body mass index, and MUAC [13].

According to the findings of the MUAC measuring research, the nutritional status of pregnant women before administration was determined to be in the normal category in 41 respondents (77.4%) and the CED category in 12 respondents (22.6%). Meanwhile, 46 respondents (86.8%) had a nutritional status in the normal group after administration, while 7 respondents (13.2%) had a nutritional status in the CED category. According to the sig. (2-tailed) value of 0.024<0.05, there is a significant difference in nutritional status before and after the intervention.

This research is in line with research conducted by Veria and Izzah (2021) which stated the influence of Providing Supplementary Food on weight gain and MUAC, it was found that there was a statically significant increase in MUAC and weight gain. MUAC increased from 21.4 cm to 22.03 cm (p=0.0001), while body weight increased from 43.2 kg to 46.3 kg (p=0.0001) and the number of CED pregnant women decreased from 100% to 81.1%, which means that PMT affects MUAC and body weight [14]. CED nutrition affects mothers owing to a failure to gain weight during pregnancy, resulting in a drop in MUAC. The rise in maternal weight associated with an increase in MUAC during pregnancy has a significant impact on the infant she is carrying [15]. Because food is eaten by the unborn baby, poor nutrition in pregnant women or CED has an effect on the womb. If the MUAC of pregnant women increases, the development of the baby in the womb will also expand and develop. Many factors can influence the prevalence of stunting in toddlers, one of which is the mother's nutritional status during pregnancy, which is caused by not being able to meet the need for good and sufficient nutritional food according to needs, resulting in suboptimal growth and development and future susceptibility to infectious diseases. Pregnant women with chronic energy deficiency (CED) or anemia are more likely to have babies born with low birth weight (LBW) [16,17]. Low birth weight is a well-known risk factor for stunting in children [18].

Malnutrition in pregnant women is one of the main risk factors for various complications of pregnancy and childbirth, including premature birth, low birth weight (LBW), and maternal and infant deaths. Adequate, varied, and balanced food intake is very important to meet the nutritional needs of pregnant women and their fetuses. The *tinutuan 8 "tinu key"* model is an example of a traditional diet that can help meet the nutritional needs of pregnant women. The *tinutuan 8 "tinu key"* is a traditional diet model originating from Minahasa, North Sulawesi. The research results of Langi G. *et al.* (2017) show that tinutuan, which is popularly known as ''Manado porridge'', is not just a food consisting of porridge and various types of vegetables as the main human need, but is a nutritious food [19]. This study found that pregnant women who consumed the *tinutuan 8 "tinu key"* had higher hemoglobin (Hb) levels and a lower risk of anemia compared to pregnant women who did not consume tinutuan. This shows that the *tinutuan 8 "tinu key"* has the potential to prevent anemia in pregnant women. Programs providing supplementary food to pregnant women with chronic energy deficiency can improve nutritional status through increasing the total number of calories consumed, increasing body weight, and increasing the size of the upper arms [20].

Conclusion

Providing adequate, varied, and balanced food using the The *tinutuan 8 "tinu key"* model can contribute to fulfilling the nutrition of pregnant women, especially macronutrients (carbohydrates and protein), and micronutrients (vitamins and minerals) so that it can help prevent the incidence of CED and anemia. This diet model can be an alternative healthy and nutritious diet for pregnant women in Indonesia.

Acknowledgements

The authors would like to thank the Health Polytechnic of Health Ministry Manado, City of Manado, Indonesia.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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HOW TO CITE THIS ARTICLE
Sesca D Solang*, Grace K. L Langi, Freike S.N Lumy, The Effect of Providing Food of *Tinutuan Tinu Key* on the Anthropometric Nutritional Status and Hemoglobin Levels of Pregnant Women. *J. Med. Chem. Sci*., 2024, 7(6) 822-829.
DOI: https://doi.org/10.26655/JMCHEMSCI.2024.6.5
URL: https://www.jmchemsci.com/article_196621.html