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Effect of Pumpkin Seed Capsules on Nutritional Status and Hemoglobin Levels of Pregnant Women with Chronic Energy Deficiency

Efecto de las Cápsulas de Semilla de Calabaza Sobre el Estado Nutricional y los Niveles de Hemoglobina de Mujeres Embarazadas con Deficiencia Energética Crónica

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SUMMARY

The nutritional state of pregnant women will affect the growth and development of the fetus from birth to adulthood. One of the nutritional problems of pregnant women is Chronic Energy Deficiency (CED). CED is one of the malnutrition problems that often occur in pregnant, caused by a lack of food intake and energy over a long period of time. One of the effects of pregnant suffering from CED is to increase the risk of maternal and short baby mortality. Pumpkin seeds are rich in macro and micronutrients. The content of micronutrients in pumpkin seeds can improve the nutritional status of pregnant women. This study aimed to assess the effect of pumpkin seed capsule administration on Middle Upper Arm Circumference and hemoglobin levels in pregnant women. This research used quasi-experimental with a non-randomized design pretest-post-test with a control group. Pregnant women who met the inclusion criteria were divided into two groups. The first group received pumpkin seed capsules (2 capsules x 700 mg) and the second group received iron folic supplements (60 mg Fe and 0.25 mg folic) for 60 days. The total sample was 63 individuals divided into 30 intervention groups and 31 in the control group. Data collected include general data, nutritional status based on Middle Upper Arm Circumference (MUAC), and hemoglobin levels of pregnant women with CED. There was a significant increase in the average MUAC and hemoglobin levels of pregnant women in both groups after the correspondent treatment (p = 0.0001). Our data show that pumpkin seed capsule administration increases MUAC and hemoglobin levels of pregnant women with CED.

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RESUMEN

El estado nutricional de la mujer embarazada afectará el crecimiento y desarrollo del feto desde el nacimiento hasta la edad adulta. Uno de los problemas nutricionales de las mujeres embarazadas es la Deficiencia Energética Crónica (DCE). La DEC es uno de los problemas de desnutrición que suele presentarse en las embarazadas, causado por la falta de ingesta de alimentos y energía en un largo período de tiempo. Uno de los efectos de las embarazadas que padecen CED es aumentar el riesgo de mortalidad materna y de recién nacidos de corta duración. Las semillas de calabaza son ricas en macro y micronutrientes. El contenido de micronutrientes en las semillas de calabaza puede mejorar el estado nutricional de las mujeres embarazadas. Este estudio tuvo como objetivo evaluar el efecto de la administración de cápsulas de semilla de calabaza en la circunferencia del brazo medio superior y los niveles de hemoglobina en mujeres embarazadas. Esta investigación fue de tipo cuasi-experimental con un diseño no aleatorizado pretest-pos test con grupo control. Las gestantes que cumplieron con los criterios de inclusión se dividieron en dos grupos. El primer grupo recibió cápsulas de semilla de calabaza (2 cápsulas x 700 mg) y el segundo grupo recibió suplementos de hierro fólico (60 mg Fe y 0,25 mg fólico) durante 60 días. La muestra total fue de 63 individuos divididos en 30 del grupo de intervención y 31 del grupo de control. Los datos recopilados incluyen datos generales, estado nutricional basado en la circunferencia del brazo medio superior (MUAC) y niveles de hemoglobina de mujeres embarazadas con CED. Hubo un aumento significativo en los niveles promedio de MUAC y hemoglobina de las mujeres embarazadas en ambos grupos después del tratamiento correspondiente (p = 0,0001). Nuestros datos muestran que la administración de cápsulas de semillas de calabaza aumenta el nivel de MUAC y hemoglobina en mujeres embarazadas con CED.

Palabras clave: *Estado nutricional, mujeres embarazadas, deficiencia energética crónica, semillas de calabaza*

INTRODUCTION

The gestation period is a period when the child's growth and development are determined by the condition of the fetus in the uterus. The nutritional state of pregnant women will affect the growth and development of the fetus from birth to adulthood. This period is very important and determines the quality of human resources (1).

Chronic Energy Deficiency (CED) is one of the malnutrition problems that often occur in pregnant, caused by a lack of food intake and energy over a long period of time. One of the effects of pregnant suffering from CED is to increase the risk of maternal and short baby mortality. Pregnant women should meet the requirements for various nutrients, notably micronutrients, to ensure a better pregnancy outcome in the future. Pregnant mothers and their unborn children can meet their nutritional needs by consuming nutritious pumpkin seeds (*Cucurbita moschata)*.

Malnutrition in pregnant women will cause problems, both for the mother and the fetus, such as anemia. Insufficient food intake, high energy expenditure, micronutrient-deficient diets, infections, and the demands of pregnancy and lactation contribute to maternal malnutrition. The main causes of anemia in pregnancy are iron deficiency, severe bleeding, and occasionally even their interaction. Malnutrition results in difficulty and prolonged labor, premature delivery, and bleeding after delivery, and can affect fetal growth, and cause miscarriage, birth defects, and low birth weight (3). CED can increase the risk of anemia due to the breakdown of protein for energy which results in an imbalance in the body so that the formation of hemoglobin is not optimal (4,5).

The results of Basic Health Research in 2018, the prevalence of CED for pregnant women in Indonesia was 17.3% specifically, in the Province of South Sulawesi it was above the national average of 19.7%, which means the cases are still high. One of the districts in South Sulawesi with health problems with the incidence of several cases still high is Bone Regency which has also been designated as a locus of stunting. Bone Regency is in third place in South Sulawesi Province for the incidence of CED, which is 21.66 % (6).

The administration of pumpkin seeds is one of the efforts to fulfill nutrition for pregnant women. Pumpkin seeds are rich in macro and micronutrients. The content of micronutrients in

pumpkin, among others; vitamins A, C, E, thiamin (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), pyridoxine (B6), calcium (Ca), iron (Fe), phosphorus (P), magnesium (Mg) and zinc (Zn) (7). 100 gram of pumpkin seeds (*Cucurbita moschata*) contains the mineral zinc 6.5 mg (8). Zinc is a micronutrient that has many important roles in body functions. It regulates specific hormone receptor genes and stimulates food intake via the afferent vagus nerve with subsequent effects on hypothalamic peptides related to the regulation of food intake. Zinc also stimulates the growth and function of taste buds, thereby influencing appetite and making intake adequate (9). Zinc consumption during the rehabilitation phase of malnutrition has been associated with rapid weight gain (10). In addition, pumpkin seeds contain a variety of compounds, such as m-carboxyphenylalanine, amino butyrate, and citrulline, as well as a number of other amino acids needed by the prostate gland, such as seminal alanine, glycine, and glutamic acid. These seeds also include the minerals Zn (zinc) and Mg (magnesium), which are essential for reproductive health (11). It contains a variety of biological properties, including antioxidant, anti-inflammatory, and anti-cancer properties (12).

Iron (Fe) in pumpkin seeds can increase hemoglobin that plays a role in carrying oxygen to body tissues. In addition, Iron also acts as a component to form myoglobin (a protein that carries oxygen to muscles). Iron also functions in the body's defense system and increases the metabolism of other nutrients (13). The content of micronutrients in pumpkin seeds can make the nutritional status of pregnant women to improve.

Middle Upper Arm Circumference (MUAC) is the circumference of the right upper arm measured at the midpoint between the tip of the shoulder and the tip of the elbow. CED status is determined based on the result of the measurement of the MUAC, which provides a simple and reliable tool for screening nutritional status and also enables rapid assessment of large populations in epidemiological field studies (2).

This study aimed to assess the effect of pumpkin seed capsule administration on Middle Upper Arm Circumference and hemoglobin levels in pregnant women.

METHODS

This research was quasi-experimental with a non-randomized design pretest-posttest with an intervention and a control group. A total of 63 pregnant women who met the inclusion criteria were divided into two groups. The first group (N =31) received pumpkin seed capsules (2 capsules x 700 mg) and the second group (N=32) received iron folic supplements (60 mg Fe and 0.25 mg folic). Sample selection was done using the following inclusion criteria, pregnant women with gestational age 0-28 weeks, nutritional status of Chronic Energy Deficiency (Middle Upper Arm Circumference) < 23.5 cm).

This research was conducted in the working area of Watampone Public Health Center and Biru Public Health Center of Bone Regency, South Sulawesi, Indonesia, in February-April, 2022. The time for implementing the intervention or data collection was carried out within 2 months. This research has obtained ethical approval from the ethics committee of the Faculty of Public Health, Hasanuddin University with the number: 1957/UN4.14.1/TP.01.02/2023.

Data collected included general data, nutritional status, and hemoglobin levels of pregnant women. The nutritional status of pregnant women was determined based on Middle Upper Arm Circumference and it was measured using a MUAC tape. Hemoglobin levels were measured using a Hemoglobin meter with the brand HemoCue and taking blood from the capillaries (fingertips). MUAC and hemoglobin levels were measured at the beginning, middle, and end of the intervention. Data were analyzed with the Wilxocon and Man-Whitney test, and a value of $p < 0.05$ was considered significant.

RESULTS

Based on the age group, in the intervention group, 66.7% were aged range 17-25 years, while in the control group the age range was 26-35 years (61.3 %). The occupational status of most respondents was not working (housewives, 73.3 %) and the control group 54.8 % (Table 1).

Table 1. Characteristics of respondents

Variable	Intervention		Control	
	N (30)	%	N (31)	%
Aged (Years)				
17-25	20	66.7	11	35.5
26-35	10	33.3	19	61.3
36-45	0	0	1	3.2
Occupational Status				
Working	8	26.7	14	45.2
Not working (housewives)	22	73.3	17	54.8

Source: Data processing, 2023

Table 2. Changes in MUAC and hemoglobin levels of pregnant women in intervention and control groups

Variable	Before (Mean±SD)	After (Mean±SD)	P-value*	△ (Mean ±SD)
MUAC (cm)				
Intervention (n=30)	22.43±0.96	22.82±0.95	0.0001	0.26±0.08
Control (n=31)	21.53±1.21	22.06±1.13	0.0001	0.53±-0.08
P Value**	0.001	0.079		
Hemoglobin (g/dL)				
Intervention (n=30)	11.087±0.83	11.347±0.76	0.0001	0.26±-0.07
Control (n=31)	10.284±0.33	11.665±0.29	0.0001	1.381±-0.04
P Value**	0.0001	0.383		

Source: Data processing, 2023
*Wilxocon, **Man-Whitney

Table 2 shows the changes in MUAC and hemoglobin levels of pregnant women with CED in intervention and control groups. There was a statistically significant increase in the MUAC values before and after intervention, in both groups ($p<0.0001$). The average basal MUAC values before intervention in both groups were significantly different with a p-value was 0.001. Meanwhile, there were no significant differences in the mean MUAC between both groups after the intervention, p-value of 0.079.

The average hemoglobin levels of pregnant women showed a statistically significant increase when compared to the data before and after the intervention, in both groups ($p<0.0001$). The average basal hemoglobin level values before intervention in both groups were significantly different with a p-value was 0.0001. While there were no significant differences in the mean hemoglobin values between both groups after the intervention, the p-value of 0.383.

DISCUSSION

Malnutrition in pregnant women can be defined based on anthropometric indicators including MUAC or biochemical analysis, which show anemia or deficiency of certain micronutrients. MUAC is considered a fast indicator in monitoring nutritional status and is highly correlated with pregnant women's body mass index (BMI) (14). Based on the collaborative studies conducted by the WHO, it was demonstrated that MUAC measurement is important in identifying maternal malnutrition.

In this case, pregnant women with MUAC threshold values <21–23 cm had a significant risk for low birth weight (LBW) (OR 1.9, 95 % CI: 95 % 1.72.1) (15). Our results indicate that the average basal value MUAC of pregnant women in the intervention group was 22.43 cm and in the control group was 21.53 cm. The group who received pumpkin seeds capsules increased MUAC by 0.26 cm, while pregnant women who received iron-folic supplementation were 0.53 cm. This increase was statistically significant in both groups when compared before and after the intervention ($p = 0.0001$). These results indicate that the provision of pumpkin seed capsules can increase the nutritional status of pregnant women. These results are in line with the findings of a study carried out on pregnant women who showed that the administration of pumpkin seed biscuits contributes to weight gain and increases the average hemoglobin level by 0.82 g/dL, the average size of the upper arm circumference by 1.0 cm and reduced the prevalence of anemia in pregnant women which, in turn, improves their nutrition status and serum zinc (3,16).

Iron carries oxygen to the body's cells and carries carbon dioxide out of the body, supporting muscle function, enzymes, protein, and energy metabolism (17). Iron is needed to produce hemoglobin, so iron deficiency anemia will cause the formation of smaller red blood cells and low hemoglobin content (18). Pumpkin seeds are used to treat malnutrition in children, and pregnant and lactating women. The content of micronutrients in pumpkin seeds can be used as an alternative supplement for pregnant women to prevent anemia and LBW in the mother and fetus (19). Our results support this concept since they show that the hemoglobin level in the group that received pumpkin seeds was increased by 0.26 ± -0.07 g/dL ($p<0.0001$). These results are in line with the research in which women of childbearing age aged 15-49 received pumpkin seed extract for 21 days, 2 times a day, and hemoglobin was measured using a digital HB meter instrument, showing that pumpkin seeds are effective in increasing hemoglobin levels in women of childbearing age, with effectiveness in the treatment group compared to the control group of 63.5 %. Thus, pumpkin seeds can be used as a complementary food for iron (Fe) supplements in women of childbearing age (20). This together with proper Zinc supplementation helps to reduce the risk of preterm birth. In effect, maternal Zinc supplementation lowers the risk of preterm birth, however, no evidence of Zinc supplements on other fetal outcomes was reported (21).

CONCLUSION

Pumpkin seed capsule administration improves the MUAC and hemoglobin levels of pregnant women with CED. Thus, pumpkin seed capsules are potentially recommended as an alternative supplement for pregnant women.

Conflict of Interest

There is no conflict of interest

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