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Original Article

The Effect of Deppamil Dangke to Pregnant Women with Chronic Energy Deficiency on the Outcome of Newborn Babies in Enrekang Regency

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ABSTRACT

Chronic energy deficiency (CED) tends to occur in pregnant women and carry detrimental effects, especially on the women during labour and on the fetus. Therefore, it is extremely important to increase nutritional intake during pregnancy for optimized newborn outcome. There are a variety of ways to treat CED, one of which is to provide additional food during pregnancy. This study aims to determine the effect of Deppamil Dangke to pregnant women with CED on the outcome of newborns. This research method used a quasi-experimental design conducted for 18 weeks in Enrekang Regency, with a population of 28 pregnant women > 20 weeks gestation who then used a exhaustive sampling technique where the sample was divided into two consisting of 14 intervention samples and 14 control samples. The results of the study were tested using Mann Whitney showing the value of ρ > α (0.05), which means that there was no difference in the outcome of newborns between the intervention group and the control group. Conclusion. Consuming Deppamil Dangke did not have a direct effect on the outcome of newborns, even though the difference was not significant, but the average outcome of newborns in mothers who consumed Deppamil Dangke + PMT was in the normal category.

Keywords: Deppamil Dangke, Chronic Energy Deficiency, Outcome of Newborns.

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INTRODUCTION

Data from the Inter-Census Population Survey (SUPAS) show that the maternal mortality rate (MMR) increases from year to year. It is indirectly caused by chronic energy deficiency (CED) in pregnant women. CED is ranked the 10th of cases in pregnant women in South Sulawesi with a percentage of 13.8%[1]. In 2021, 513 pregnant women with CED (14%) and 171 births with low birth weight (LBW) (5.46%) were recorded in Enrekang Regency[2].

Nutrition is an important concern in pregnant women as it determines the quality of growth and development of the foetus and greatly affects birth and neonatal period[3,4].

Therefore, it is critical to increase macro- (i.e., carbohydrates, fats, and proteins) and micro-nutrients (i.e., iron, vitamins, and minerals) during pregnancy[3,5]. One of the government's efforts to achieve this end, and therefore deal with the CED problem, is to provide supplementary food for pregnant women[6].

Previous research has revealed that the administration of government-provided supplementary food to pregnant women with CED for 90 days resulted in an increase in upper arm circumference (UAC) of 23.5 cm, which indicates an increase in nutritional status[7,8]. However, some pregnant women were found not to consume the government-provided supplementary food due to boredom, which affected their level of compliance in consuming the product[9].

South Sulawesi is a host of a variety of food products spread across several regencies. Among such regencies, Enrekang Regency produces food products of good quality. The regency produces a traditional food product naturally from fresh bovine milk with a strong milk aroma named dangke[10].

According to a 2017 study, dangke contains 44.93% water, 8.03% fat, 24.54% protein, and 19.3% carbohydrate[11]. Dangke can be further processed into crackers for pregnant women's consumption. It was reported that 100 g of dangke crackers contain 9% protein and 8 mg of iron[12]. Another laboratory test conducted on January 6, 2022 showed that 100 g of dangke contains iron (Fe) at 0.86 µg/g, calcium at 1,281.37 µg/g, carbohydrate at 0.74%, and glucose at 0.82%[13].

This research was conducted as an innovation based on the local wisdom of Enrekang Regency, where dangke was used as an ingredient of an additional food product for pregnant women. This food is called Deppamil Dangke, which in the regional language of Enrekang Regency means Dangke-based cakes for pregnant women. In 100 g of Deppamil Dangke, 41.69% carbohydrate, 10.34% protein, 26.10% fat, 0.77% crude fiber, 46.32% glucose, vitamin A at 473.21µg/g, vitamin C at 294.26µg/g, iron (Fe) at 22.46µg/g, and calcium at 1,202.41µg/g are contained as a source of calories for pregnant women [14].

Deppamil dangke has been tested on 30 pregnant panellists, and the results showed that 63.3% of them strongly liked the taste, 53.3% strongly liked the texture, 50% strongly liked the colour, and 46.7% strongly liked the aroma. It was thus concluded that Deppamil Dangke is well-liked by pregnant women and is highly suitable to be used as a supplementary food product and an intervention material for pregnant women with CED in comparison to government-provided supplementary foods.

This study aims to determine the effect of Deppamil Dangke to CED pregnant women on the outcome of newborns in Enrekang regency.

METHOD

This study using a quasi-experimental design for 18 weeks at some public health centres in Enrekang Regency. The population in this study consisted of all pregnant women with CED who were pregnant for > 20 weeks. A sample of 28 respondents was selected by *exhaustive* sampling. The variables studied were the newborns outcome consisting of birth weight, birth length and newborns hemoglobin level.

The respondents were then divided into two groups: 14 pregnant women were assigned to an intervention group, and 14 pregnant women were assigned to a control group. The respondents in the intervention group were asked to consume six pieces of *Deppamil Dangke* a day until just before delivery, and the respondents in the control group were asked to consume three pieces of government-provided supplementary food a day. An examination of labour outcome was conducted by checking the haemoglobin level of the baby after cutting the umbilical cord using Easy Touch GCHb and measuring the weight and length of the baby after early breastfeeding initiation (EBI). Data were analyzed in a descriptive way then to determine the effect of *Deppamil Dangke* was carried out bivariate analysis using the *Mann Withney* alternative test.

The study has obtaining approval ethics by The Health Research Ethics Committee of the Muhammadiyah Faculty of Health University Medicine and Science Makassar number 209/UM.PKE/XI/44/2022.

RESULTS

Table 1. Distribution characteristics of respondents.

Characteristics of Respondents		Sample Group				Total	
		Intervention		Control		f	%
		f	%	f	%		
Age	17-20 years	3	100.0	0	0.0	3	100.0
	21-24 years	2	100.0	0	0.0	2	100.0
	25-28 years	5	62.5	3	37.5	8	100.0
	29-32 years	1	14.3	6	85.7	7	100.0
	33-36 years	2	33.3	4	66.7	6	100.0
	> 36 years	1	50.0	1	50.0	2	100.0
Gestational Age	20-24 Weeks	6	37.5	10	62.5	16	100.0
	≥ 25 Weeks	8	66.7	4	33.3	12	100.0
Work	Farmer	8	66.7	4	33.3	12	100.0
	Housewife	5	45.5	6	54.5	11	100.0
	Honorary Teacher	1	20.0	4	80.0	5	100.0
Parity Group	Parity 1	6	75.0	2	25.0	8	100.0
	Parity 2	5	45.5	6	54.5	11	100.0
	Parity 3	2	66.7	1	33.3	3	100.0
	Parity 4	0	0.0	5	100.0	5	100.0
	Parity 5	1	100.0	0	0.0	1	100.0
Birth Weight Category	<2500 gr	0	0.0	4	100.0	4	100.0
	2500-4000 gr	14	60.9	9	39.1	23	100.0
	>4000 gr	0	0.0	1	100.1	1	100.0
Birth Length Category	<48 cm	4	50.0	4	50.0	8	100.0
	48-50 cm	10	55.6	8	44.4	18	100.0
	>50 cm	0	0.0	2	100.0	2	100.0
Infant Hemoglobin Levels	<19.3 gr/dl	1	14.3	6	85.7	7	100.0
	19.3-33 gr/dl	13	61.9	8	38.1	21	100.0
Energy Intake	Pre						
	< 2527 cal	13	52.0	12	48.0	25	100.0
	≥ 2527 cal	1	33.3	2	66.7	3	100.0
	Post						
	< 2527 cal	0	0.0	7	100.0	7	100.0
	≥ 2527 cal	14	66.7	7	33.3	21	100.0

Table 1 shows the characteristics of respondents by age group. It is shown in the table that in the 17–20 years *age group* more respondents were in the intervention group (100%) than in the control group (0.0%), in the 21–24 years age group more respondents were in the intervention group (100%) than in the control group (0.0%), in the 25–28 years age group more respondents were in the intervention group (62.5%) than in the control group (37.5%), in the 29–32 years age group more respondents were in the control group (85.7%) than in the intervention group (14.3%), in the 33–36 years age group more respondents were in the control group (66.7%) than in the intervention group (33.3%), and in the > 36 years age group the numbers of respondents in both the intervention group and the control group were equal (50.0%). The characteristics of respondents according to gestational age. In the groupof pregnant women with gestational age of ≥ 25 weeks, there were more respondents in the intervention group (66.7%) than the control group (33.3%), and in the 20–24 weeks gestation age group, there were more respondents in the control group (62.5%)

than in the intervention group (37.5%). The characteristics of respondents according to work. According to the table above, in the farmer group there more respondents in the intervention group (66.7%) than in the control group (33.3%), in the housewife group, the numbers of respondents in the intervention group and the control group were almost equal (45.55% vs 54.5%), and in the honorary teacher group there were more respondents in the control group (80.0%) than in the intervention group (20.0%). The characteristics of respondents according to parity. In the para 1 group there were more respondents in the intervention group (75.0%) than in the control group (25.0%), in the para 2 group there were more respondents in the control group (54.5%) than in the intervention group (45.5%), in the para 3 group there were more respondents in the intervention group (66.7%) than in the control group (33.3%), in the para 4 group there were more respondents in the control group (100.0%) than in the intervention group (0.0%), and in the para 5 groupthere were more respondents in the intervention group (100.0%) than in the control group (0.0%).

The characteristics of respondents according to birth weight. In the < 2,500 g birth weight group more respondents were in the controlgroup (100.0%) than in the intervention group (0.0%), in the 2,500–4,000 g birth weight group more respondents were in the intervention group (60.9%) than in the control group (39.1%), and in the > 4,000 g birth weight group more respondents were in the control group (100.0%) than in the intervention group (0.0%). The characteristics of respondents according to birth length. In the 48–50 cm birth length group more respondents were in the intervention group (55.6%) than in the control group (44.4%), in the < 48 cm birth length group the numbers of respondents were equal in the intervention group and the control group (50.0%), and in the > 50 cm birth length group more respondents were in the control group (100.0%) than in the intervention group (0.0%). The characteristics of respondents according to the infant haemoglobin level. In the < 19.3 gr/dl haemoglobin level group more respondents were in the control group (85.7%) than in the intervention group (14.3%), and in the 19.3–33 gr/dl haemoglobin level group more respondents were in the intervention group (61.9%) than in the control group (38.1%). The characteristics of respondents according to energy intake before and after intervention. Before intervention, the group of mothers who had energy intake of < 2,527 cal had more respondents in the intervention group (52.0%) than in the control group (48.0%), and the group of mothers who had energy intake of ≥ 2,527 cal had more respondents in the control group (66.7%) than in the intervention group (33.3%). After intervention, the group of mothers who had energy intake of < 2,527 cal had more respondents in the control group (100.0%) than in the intervention group (0.0%), and the group of mothers who had energy intake of ≥ 2,527 cal had more respondents in the intervention group (66.7%) than in the control group (33.3%).

Analysis of the Effect of *Deppamil Dangke* on Delivery Outcomes

The analysis of the effect of *Deppamil Dangke* on labour outcomes was conducted using the Mann- Whitney Test with the consideration that the sample used was non-random. Thus, the assumption for a parametric statistical test was not fulfilled.

Table 2. The Effect of *Deppamil Dangke* on the Baby's Birth Weight, Birth Length, and Haemoglobin Level.

Variables	Sample Groups				Statistical Test	
	Intervention		Control		U Count	ρ
	Mean	SD	Mean	SD		
Birth Weight	2,911.79	295.990	2,926.29	606.927	90.500	0.730
Birth Length	48.36	1.082	48.71	2.164	92.000	0.775
Hemoglobin Level	22.450	1.7145	21.421	2.7502	81.000	0.434

Table 2 show that the average birth weight of the intervention group was 2,911.79 ± 295.990 g, while the average birth weight of the control group was 2,926.29 ± 606.927 g. The average birth length of the intervention group was 48.36 ± 1.082 cm, while the average birth length of the control group was 48.71 ± 2.164 cm. Lastly, the average infant haemoglobin level of the intervention group was 22.450 ± 1.7145 g/dl, while the average infant haemoglobin level of the control group was 21.421 ± 2.7502 gr/dl.

Furthermore, the statistics obtained from the Mann-Whitney Test show the following:

1. There was no difference in birth weight between the intervention group andthe control group, with a p-value of > 0.05 (0.730). This indicates that the *Deppamil Dangke* did not have any direct effect on the baby's birth weight.
2. There was no difference in birth length between the intervention group and the control group, with a p-value of > 0.05 (0.775). This indicates that the *Deppamil Dangke* did not have any direct effect on the baby's body length.
3. There was no difference in infant haemoglobin level between the intervention group and the control group, with a p-value of > 0.05 (0.434). This indicates that the *Deppamil Dangke* did not have any direct effect on the baby's haemoglobin level.

Based on the data analysis results, it was found that the *Deppamil Dangke* did not have any effect on delivery outcomes. Although the difference was not significant, the average outcome of newborns in mothers who consumed *Deppamil Dangke* + government-provided supplementary food was in the normal category.

DISCUSSION

The Effect of *Deppamil Dangke* on Birth Weight.

The average birth weight of babies whose mothers consumed *Deppamil Dangke*, 2,911.79, was in the normal category (2500–4000 gr), with an SD of 295.990 cm. This was because the combination of *Deppamil Dangke* and government-provided supplementary food contains 225 g of carbohydrate, 25 g of protein, 1,638 mg of calcium, and 33 mg of iron, which is high enough to help meet daily nutritional needs. Previous research showed that adequate consumption of carbohydrate, protein, and iron in pregnant women is associated with an increase in birth weight. According to that study, adequate consumption of carbohydrate and protein in pregnant women can increase birth weight by 64.4 grams and 64.6 grams, respectively, while adequate consumption of iron in pregnant women can increase birth weight by 76.6 grams[15].

In general, nutritional intake during pregnancy, including the intake of carbohydrate, protein, and iron, can affect the growth and development of the foetus, and it is reflected by, among other things, birth weight. Several studies have shown that low carbohydrate intake can increase the risk oflow birth weight or premature birth, while adequate protein intake can help increase the baby's growth and birth weight[16]. On the other hand, iron deficiency during pregnancy can cause anaemia in pregnant women and affect the baby's birth weight[17].

The importance of carbohydrate and protein intake in pregnancy is primarily associated with healthy foetal growth and good birth weight. Adequate carbohydrate intake can help provide energy for foetal growth, while protein helps build quality baby muscles and body tissues. Meanwhile, iron is important to help form red blood cellsin infants and prevent iron deficiency in pregnant women, which can cause low birthweight or birth defects.

The Effect of *Deppamil Dangke* on Birth Length.

The average birth length of babies whose mothers consumed *Deppamil Dangke*, 48.3 ± 1.082 cm, was categorized as normal as *Deppamil Dangke* and the government-provided supplementary food contains enough nutrition to help meet pregnant women's daily nutritional needs. Several studies have been conducted to determine the relationship between the intake of carbohydrate, protein, and iron in pregnant women and the baby's birth length. A study

showed that protein and iron intake in the third trimester of pregnancy has a significant relationship with the baby's birth length[18]. Subsequent studies have shown that iron intake in pregnant women has a significant relationship with birth length, especially in women with iron deficiency. Still some subsequent studies showed that sufficient iron intake in pregnant women is positively related to the baby's birth length, but no significant relationship was found between carbohydrate intake and the baby's birth length[19–21].

The Effect of *Deppamil Dangke* on Infant Haemoglobin Level.

The average haemoglobin level in babies whose mothers consumed *Deppamil Dangke* and the government-provided supplementary food was influenced by the content of *Deppamil Dangke*, which is high enough to help meet pregnant women's daily nutritional needs. Adequate nutritional intake of carbohydrate, protein, and iron in pregnant women has been reported to have a positive effect on the haemoglobin level of the baby. This is because adequate nutrition can help the optimal formation of red blood cells in the foetus in the womb.

Haemoglobin is a protein contained in red blood cells that carries oxygen throughoutthe body. Inadequate nutritional intake in pregnant women can cause anemia, which can reduce haemoglobin levels in the baby.

Several theories explain the relationship between nutritional intake in pregnant women and the baby's hemoglobin level. One theory is that adequate nutritional intake in pregnant women can increase the production of erythropoietin, a hormone that stimulates the formation of red bloodcells. In addition, adequate nutrition can also increase the absorption of iron from food and increase the availability of iron for the formation of red blood cells[22,23].

Previous research showed that sufficient intake of carbohydrate, protein, and iron in pregnant women can increase the haemoglobin level of the baby. A study found that pregnant women who consume adequate amounts of protein have a lower risk of giving birth to babies with low haemoglobin levels[24]. Other studies have shown that pregnant women who consume sufficient amounts of carbohydrate and iron also have a lower risk of giving birth to babies with low haemoglobin levels[25].

There are also studies finding no significant relationship between nutritional intake in pregnant women and the haemoglobin level of the baby. A study showed that protein and iron intake in pregnant women is not related to the baby's hemoglobin level, but sufficient consumption of carbohydrate[26].

In general, although study results vary, adequate intake of carbohydrate, protein, and iron in pregnant women is important to prevent anemia and it can affect the baby's hemoglobin level.

CONCLUSION

Based on the results of the study and discussion, it is concluded that consuming Deppamil Dangke didn't have a direct effect on the outcome of newborns, although the difference was not significant, the average outcome of newborns in mothers who consumed Deppamil Dangke + government-provided supplementary food was in the normal category.

Further research needs to be carried out using a larger sample to determine the effect of Deppamil Dangke on delivery outcomes, especially on the baby's birth weight, birth length, and haemoglobin level. It is also recommended that health workers, especially those in the work area of Enrekang Regency, make Dangke an ingredient and develop Deppamil Dangke as a carbohydrate-, iron-, and protein-rich government-provided supplementary food, which has been proven to be able to increase food intake in pregnant women, especially those with CED, so that the nutrition of pregnant women can be increased and the birth outcome can be optimal.

CONFLICTS OF INTEREST:
The authors declare no conflict of interest.

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