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**FERRITIN & HAEMOGLOBIN LEVEL On 0-6 MONTH BABIES FROM
MOTHERS WHO RECEIVED HEALTH EDUCATION ABOUT LACTATION
MANAGEMENT WITH MODELLING APPROACH**

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Abstract

Introduction: mother is the first and primary support for a baby that has a role as a health agent for children's growth and development. Therefore, knowledge in location management is imperative as a foundation in maintaining the children's health, mainly nutritional status. Some indicators of nutrition status are ferritin and hemoglobin level. This study aimed to find the effectiveness of health education about lactation management with the Modelling Approach to the level of Ferritin and Hemoglobin on babies age 0-6 months in Maros Regency, South Sulawesi Province, Indones. **Methods:** Quasi-experimental pre-posttest with control group design was used. Eighty-one participants were purposively sampled, 41 were allocated to the intervention group, and 40 to the control group. The intervention given was a series of health education with a modeling approach related to lactation management that conducted in the third trimester of pregnancy, the first week after labor, and after the babies aged three months. The blood sample from the babies aged six months was collected to check the ferritin and hemoglobin level. The data were analyzed statistically with a significant level of $\alpha < 0.05$.

Results: The study found the average of ferritin and hemoglobin level on six-month babies in the intervention group were 42.85 ± 36.34 ng/ml and 11.60 ± 1.01 gr/dl, whereas for the control group were 71.86 ± 83.93 ng/ml and 11.17 ± 0.78 gr/dl. However, the ferritin and hemoglobin level on babies between the two groups were not different significantly ($p=0.071$ and $p=0.051$)

Conclusion: health education about lactation management with the modeling approach did not considerably affect the baby's level of ferritin and hemoglobin. However, it effectively increased maternal knowledge on how to maintain their baby's health status.

Keywords: ferritin, hemoglobin, health education, modeling

INTRODUCTION

Since the child is in the womb until the age of 2 years is a golden period and is called a critical period for physical, mental, and social development (Devi 2012). The quality of growth and development of infants at this crucial period is influenced by genetic factors that are the primary potential and environmental factors that influence it. These environmental factors will determine whether the real potential will be able to develop optimally (Soetjiningsih and Gde 2014). Mother is the first and foremost environmental factor that can play a role in the growth and development of infants. Therefore, the empowerment of mothers by increasing their ability to care for babies becomes very important as a health effort to maintain their survival while at the same time improving children's quality of life to achieve optimal physical, mental, emotional and social development and compound intelligence according to their genetic potential (Soetjiningsih and Gde 2014).

Globally, 165 million children are stunted; Nutrition underlies 3.1 million deaths in children aged less than five years (Bhutta, Das et al. 2013).

Studies show a significant correlation between a mother's education level and the nutritional status of her child and life expectancy (Devi 2012). Based on Frost's research, it shows that each increase in the

level of maternal education allows stunting to decrease by about 44 percent of children (Frost, Forste et al. 2005).

Sometimes mothers do not know the importance of variety and balance in eating patterns and the right amount and type of food needed by children to meet food needs. Without adequate knowledge, malnutrition and poor nutritional status can occur in households with sufficient income, food, and health services (FAO 2013).

The effectiveness of nutritional education on child growth and anemia, especially through increased breastfeeding and complementary feeding practices, that the Lancet series on maternal and child nutrition, explained that communication of behavioral changes in infants and children's feeding as one of the 15 interventions effective evidence-based to reduce global nutrition (Bhutta, Ahmed et al. 2008).

Ten studies assessed the effects of nutritional education and seven studies that evaluated the impact of supplementary feeding (one trial with three intervention groups in both categories).

Knowledge gaps are still being sought on how best to combine stimulation and nutrition interventions in existing health services to expand programs on a large scale (Yousafzai, Rasheed et al. 2014). Knowledge of maternal nutrition and child feeding practices are fundamental in the growth and development of children.

Without adequate nutritional knowledge and optimal feeding practices, poor nutritional status in children can occur even in households with adequate food and income, proper sanitation, and health services (Jemide, Ene-Obong et al. 2016).

One approach to learning theory used in health education is social learning theory developed by Albert Bandura. Modeling is a fundamental concept of social learning theory whose focus is ultimately on realizing one's abilities through efforts to increase attention, retention, reproduction, and motivation during the learning process. (Ewen 2014). Through health education with this modeling approach, it is expected to improve the ability and competence of mothers in caring for babies, especially in stimulating growth and development of infants, especially lactation management for infants aged 0-6 months. This study was conducted to identify differences in levels of ferritin and hemoglobin in infants aged 0-6 months from mothers who received lactation management education with a modeling approach.

MATERIALS AND METHODS

This research has been carried out in the working area of Barandasi Health Center, Lau District, and Hasanuddin Health Center, Mandai District, Maros Regency. The study was conducted from July 2009 to September 2010. The total

sample consisted of 81 people consisting of 41 intervention groups and 40 control groups according to the research criteria. The methods used in health education are demonstrations, re-demonstrations, and simulations, while the health education aids used are leaflets, flip sheets, ferritin assays, and hemoglobin and phantom. The method in this study is a quasi-experimental pre-post with control group design. Efforts to empower mothers are by providing health education. The treatment is in the form of giving a health education with a modeling approach. The health education used is health education with a modeling approach that focuses on practice in its activities. Health education in this study was carried out three times, namely health education I, by using a module on lactation management (breastfeeding) given at the end of the third trimester of pregnancy. Health education II using a module on stimulation of growth and development 1 (infants 0-3 months) given in the first week of postpartum and health education III using a module on stimulation of growth and development 2 (infants 3-6 months) delivered when the baby is three months old. The research instrument used in this study was a questionnaire and observation sheet. Data analysis was carried out univariate and bivariate to see an overview of each variable, distribution, and frequency, such as (sex and age) and see the relationship

between nutrient intake and nutritional status. The results obtained were tested using the Wilcoxon test.

RESULTS

1. Analysis of Respondent Characteristics

Variable	Group		p
	Intervention (n=41)	Control (n = 40)	
Average mother's age (years)	25,15 ± 4,59	25,1 ± 5,46	0,78*
Average husband's age (years)	28,3 ± 5,15	29,6 ± 5,96	0,49*
Mother's education	36 (87,8)	26 (65,0)	0,005**
a. Low	5 (12,2)	14 (35,0)	
b. High			
Husband education			
a. Low	30 (73,2)	17 (42,5)	0,01**
b. High	11 (26,8)	23 (57,5)	
Husband occupation			
a. Public servant/National Army/Police man	2 (4,9)	5 (12,2)	0,26**
b. Entrepreneur	39 (95,1)	35 (87,5)	
Family income (rupiah)			
a. ≤ 1 million	32 (78,0)	26 (65,0)	0,19**
b. > 1 million	9 (22,0)	14 (35,0)	
Total family members			
a. ≤ 4	16 (39,0)	27 (67,5)	0,01**
b. > 4	25 (61,0)	13 (32,5)	

Table 1. Analysis of respondent characteristics in the treatment and control groups

Table 1 above shows the results of respondents' homogeneity tests based on maternal age, husband's age, husband's occupation, and family income. The results showed no difference in the type of husband's work between the treatment group and the control group.

2. Analysis of the influence of health education by approaching the modeling of differences in infant lactation status, infant health status, and growth in infant development

a. The Difference in Infant Lactation Status

Table 2. Lactation status categories between the treatment group and the control group

Group	Lactation Status				Total	p
	Exclusive		Nonexclusive			
	N	%	n	%		
Intervention (n=34)	12	29,3	29	70,7	41	100
Control (n=34)	1	2,5	39	97,5	40	100

These results indicate that the sixth minor hypothesis is accepted that there are differences in the lactation status of infants from mothers who are given health education to groups of mothers without health education.

b. The Difference in Infant Health Status

1) Infant Ferritin Levels

Table 3. Differences in ferritin levels of 6-month-old infants between the treatment group and the control group

Group	Infant Ferritin Rerata ± SD	p
Intervention (n=34)	42,85 ± 36,34	0,071
Control (n=34)	71,86 ± 83,93	

Statistically, the results did not differ significantly ($p=0,071$).

Table 4 Differences in infant ferritin levels before and after treatment between the treatment group and the control group.

Infant Ferritin Level	Group	
	Intervention (n=10)	Control (n=10)
	Mean \pm SD	Mean \pm SD
Pre-test	267,2 \pm 107,4	186,1 \pm 68,0
Posttest	33,8 \pm 15,9	42,8 \pm 29,0
P	0,000	0,000
Δ	233 \pm 109,3	174 \pm 50,0

The results of the study as shown in table 4 show that in the treatment group the mean ferritin content of newborns (pre-test) was 267.2 ± 107.4 and the mean ferritin level of infants aged six months (post-test) 33.8 ± 15.9 with a difference value (Δ) of 233 ± 109.3 . The results of the study in the control group, mean newborn ferritin levels (pre-test) of 186.1 ± 68.0 and mean ferritin levels of infants aged six months (post-test) 42.8 ± 29.0 with a difference value (Δ) of 174 ± 50.0 .

2) Infant Hemoglobin Level

Table 5. Differences in hemoglobin levels in infants aged six months between the treatment group and the control group

Kelompok	Infant Hemoglobin	p
	Mean \pm SD	
Intervention (n=35)	11,60 \pm 1,01	0,051
Control (n=34)	11,17 \pm 0,78	

Based on the unpaired t-test, the p-value = 0.051 is obtained, meaning that there is no difference in the mean hemoglobin level of 6-month-old infants between the treatment and control groups.

Table 6. Differences in infant hemoglobin levels before and after treatment in the treatment and control groups

Infant Hb level	Group	
	Intervention (n=15)	Control (n=16)
	Mean \pm SD	Mean \pm SD
Pre-test	13,5 \pm 1,41	13,52 \pm 2,32
Posttest	11,3 \pm 0,82	11,1 \pm 0,80
P	0,00	0,001
Δ	2,133 \pm 1,889	0,097 \pm 0,32

The results of the study, as shown in Table 6 show that in the treatment group the mean newborn hemoglobin level (pre-test) was 13.5 ± 1.41 and the average hemoglobin level of infants aged six months (post-test) 11.3 ± 0.82 with the difference value (Δ) of $2,133 \pm 1,889$. The results of the study in the control group, the average newborn hemoglobin level (pre-test) of 13.52 ± 2.32 , and the average hemoglobin level of infants aged six months post-test) of 11.1 ± 0.80 with the difference value (Δ) in the amount of 0.097 ± 0.32 .

DISCUSSION

Characteristics of mothers are one of the concepts of maternal nursing role theory that influence the achievement of the role of being a mother. The results of this study indicate that in the treatment group the average level of education is still at a low level of education that is as much as 87.8% in mothers and 73.2% in husbands, compared to the average level of education

in the control group that is low education in mothers as much as 65% and in the husband as much as 42.5%. The treatment group described the characteristics of rural communities, while the control group described the attributes of suburban communities that had more comprehensive access to information.

The level of education of both parents, especially mothers, is very influential in the way of childcare, as stated by Wong (2003) that the education and experience of parents in childcare will affect their readiness in carrying out the role of care. One of them is meeting the nutritional needs of children as babies at the age of 0-6 months.

Breast milk is the best and natural food for babies. Breastfeeding is a natural process, but some mothers fail to breastfeed or stop breastfeeding earlier than they should (WHO, 2003). Based on this, the health in this study was conducted as an effort to increase the knowledge, attitudes, and abilities of mothers to be more confident in carrying out their role as mothers, especially in giving milk to their babies. Health education in lactation management contains the benefits of breastfeeding, handling if there are obstacles in breastfeeding and breastfeeding techniques through demonstration and simulation methods. The results of this study indicate that health

education with a modeling approach to lactation management given to the treatment group can increase exclusive breastfeeding to infants. There was a significant difference in infant lactation status ($p = 0.001$) between the treatment and control groups. Health education with this modeling approach increases the motivation of mothers to breastfeed their babies until the age of 6 months exclusively. This finding can be seen in Table 5.12, which shows that 29.3% ($n = 12$) mothers from the treatment group exclusively breastfed and only 2.5% ($n = 1$) mothers of the control group exclusively breastfed.

The results of this study are following the results of the research of Blyth et al. (2002) that strategies and efforts to increase self-efficacy through health providers by health workers can increase the confidence of new mothers in breastfeeding. As many as 28.6% of mothers continue to breastfeed until the age of four months, even though these mothers experience difficulties and challenges in the form of insufficient supplies ASI. Another problem in breastfeeding, according to Palda et al. (2004), commercial discharge packages about formula milk given to postpartum mothers have been shown to reduce breastfeeding rates in infants.

This finding illustrates that the challenge for a mother who has a baby is

big enough to provide exclusive breastfeeding. However, health education with the modeling approach given in this study has increased the confidence of the mother, which ultimately increases the mother's motivation to continue to provide exclusive breastfeeding to her baby.

These results indicate that the last phase of health education with the modeling approach, namely increased motivation, has been achieved. The formation of motivation in the concept of modeling is a hidden cognitive activity that requires behavioral consequences to be realized. This matter is influenced by vicarious reinforcement of oneself (Bastabel, 2002). Based on in-depth interviews with respondents, most of the mothers felt the benefits of health education in this study.

This study is following the research of Albernaz (2003), which states that lactation counseling can prevent the early cessation of breastfeeding and is effective in increasing exclusive breastfeeding, including the duration of breastfeeding in Brazil. Likewise, research conducted by Aidam (2005) that lactation counseling activities and nutrition counseling training for mothers can increase exclusive breastfeeding in infants 0-6 months, as well as increase knowledge and physical growth of children aged 12-24 months in Ghana and Pelotas. Another study by Dewey

(2004) also reported that in infants who were not given iron, iron levels were higher in the group who exclusively breastfed for up to 6 months. In infants who are not given iron, iron status is higher in infants who are breastfed with supplementary food until the age of six months. The results recommend exclusive breastfeeding for six months with iron supplementation.

According to WHO (2000 in WHO, 2005b), babies who are given milk other than breast milk, have a 17 times greater risk of experiencing diarrhea and 3 to 4 times more likely to get ARI than babies who are breastfed. This finding shows that breastfeeding is related to the baby's health status.

The third concept of MRA theory is infant characteristics, which include the baby's temperament, baby's appearance, baby's cues, and health status and will affect the attachment process. In this study, the variables representing health status are the ferritin level and the baby's hemoglobin level. The results of the study, as shown in Table 4, show that in the treatment group the mean ferritin content of newborns (pre-test) was 267.2 ± 107.4 and the mean ferritin level of infants aged six months post-tests) 33.8 ± 15.9 with a difference value (Δ) of 233 ± 109.3 . The results of the study in the control group, mean newborn ferritin levels (pre-test) of 186.1 ± 68.0 and mean ferritin levels of infants aged six

months (post-test) 42.8 ± 29.0 with a difference value (Δ) of 174 ± 50.0 . The results of this study indicate that ferritin levels at six months in the treatment group were lower (42.85 ± 36.34) than in the control group (71.86 ± 83.93). Statistically, the results were not significantly different ($p = 0.071$). The mean ferritin values of 6-month-old infants for both groups were within normal limits (7-140 ng / ml) (Nelson, 2000)

The results of the study, as shown in Table 6 show that in the treatment group the mean newborn hemoglobin level (pre-test) was 13.5 ± 1.41 and the average hemoglobin level of infants aged six months (post-test) 11.3 ± 0.82 with the difference value (Δ) of $2,133 \pm 1,889$. The results of the study in the control group, the average newborn hemoglobin level (pre-test) of 13.52 ± 2.32 , and the average hemoglobin level of infants aged six months (post-test) of 11.1 ± 0.80 with the difference value (Δ) in the amount of 0.097 ± 0.32 . The results showed that the mean baby hemoglobin level was higher in the treatment group (mean = 11.6 ± 1.01) compared to the control group (mean = 11.17 ± 0.78) with a p-value = 0.051, meaning that there was no difference in hemoglobin levels six-month-old infants between the treatment and control groups. The mean hemoglobin value of infants aged

six months for both groups is within normal limits (11 gr/dl) (Nelson, 2000).

According to Yip and Dallman (1996), iron stores will increase during the first three months after birth and decrease in the fourth to sixth months, so breastfed children usually do not have iron deficiency during the first six months. Ferritin and hemoglobin levels that are within normal limits are indispensable in growth and development because iron plays a role in energy metabolic steps, iron plays a role in the process of immunity to enhance immunity and phagocytic ability. It plays a role in the function of neurotransmitters in the brain during the process of differentiation, synaptogenesis, and myelination of baby brain cells.

There is something quite interesting from the results of research on hemoglobin levels and infant ferritin levels in both groups, especially the treatment group, which is obtained an average high hemoglobin level but a mean low infant ferritin level. This fact is due to the body's autoregulatory mechanism for iron. If the need for iron increases is associated with rapid growth, then, a portion of tissue ferritin will leave the cell, resulting in low serum ferritin concentrations. Serum ferritin levels can describe the state of iron stores in tissues (Almatsier, 2003).

The thing to note is that normal serum ferritin levels do not always indicate

iron status under normal conditions. Because the iron status is reduced first, then followed by ferritin levels. This is what supports why hemoglobin levels can be higher even though ferritin levels are low.

The mechanism is related to the process of iron deficiency that occurs in 3 stages: 1) depletion of iron reserves so that ferritin will decrease but does not cause functional changes; 2) iron-deficient erythropoiesis characterized by a decrease in serum iron levels and a decrease in saturated transferrin levels of less than 16%; 3) the final stage is iron deficiency anemia which is characterized by a decrease in hemoglobin levels (Almatsier, 2003).

Mercer (2006) explains that in MRA theory, the expected outcome of a mother's achievement of her role as a mother is the child outcome variable including cognitive/mental status, growth and development, behavior level, social competence, and infant health status. In this study, the variables studied were the growth and development of infants.

CONCLUSION

Health education about lactation management with the modeling approach does not significantly influence infant ferritin and hemoglobin levels, but on the other hand, the interventions given to respondents effectively increase mothers' knowledge about how to maintain their

baby's health status. In this case, further research is needed to find out the right intervention.

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