

The Effect of Infant Massage on Nutritional Status and IGF-1 of Malnourished Babies Aged 6-12 Months

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Abstract

Malnourished and poor nutrition are still a health center problem in Indonesia. A good nutritional intake can often not be fulfilled by a child, including due to various factors. Baby massage is a touch therapy that is carried out on baby so that it can provide assurance of ongoing body contact, maintain a feeling of security in the baby and strengthen the parent's love cord with the baby. The purpose of this study was to analyze the effectiveness of baby massage by mothers on improving the nutritional status of baby with malnutrition aged 6-12 months. This study used a quasi-randomized pre-test and post-test control group design. Samples were 48 babies aged 6-12 months with malnutrition divided into two groups (intervention and control group). This research was carried out for 3 months. Results showed that stimulation of baby massage is effective in increasing mean IGF-1 levels for malnourished baby aged 6-12 months, namely the average IGF-1 level in the pre-intervention group for baby massage by 1.37 ± 1.00 , showed a significant increase ($p = 0.003$). Whereas in the control group showed a significant increase ($p = 0.001$) with the average IGF-1 pretreatment level was 3.37 ± 8.15 . The results of the case and control group analysis showed significant differences in mean IGF-1 levels ($p = 0.002$) or ($p < 0.05$). Baby massage is effective in increasing nutritional status and IGF-1 in baby aged 6-12 months. Babies' Mother and health provider are recommended to apply baby massage to improve nutritional status of malnourished babies.

Keywords: Infant Massage; Nutritional Status; IGF-1; Malnutrition

INTRODUCTION

Stunting is one of the health problems faced by Indonesia with a high prevalence of stunting compared to other middle-income countries. In 2019, the prevalence of stunting in Indonesia was 27.7 percent or in other words, 28 out of 100 children under five suffered from stunting, which is a condition where toddlers have a length or height that is less than their age (Badan Pusat Statistik Indonesia, 2019). This growth failure condition occurs due to lack of nutritional intake for a long time and the occurrence of repeated infections. These two factors can be influenced by inadequate parenting, especially in the first 1000 days of life (HPK) (Kementerian Kesehatan RI, 2014).

Every year it is estimated that 7% of Indonesian children under five (around 300,000 people) die due to malnutrition (Riskesdas, 2018). This means that every 2 minutes there is a death of one toddler out of 170,000 toddlers (60%) of whom are due to malnutrition. According to the Demographic survey, the incidence of infant and toddler weight under the red line in Indonesia in 2013, 10-12 million (50-69.7%) children under five in Indonesia (4 million of whom were under one year old) had very poor nutritional status and result in death (Kementerian Kesehatan RI, 2018).

Based on the results of Riskesdas, 2018, the nutritional status of children under five can be measured by the index of weight per age (W/U), height per age (TB/U) and weight per height (W/TB). The prevalence of undernutrition status in NTB Province is poor nutrition 4.4% and malnutrition 14.4% higher than the national figure, namely malnutrition 3.8% and malnutrition at 11.4% with the prevalence of nutritional status based on the age group 6-11 months, namely 9.2% with nutritional status more or less higher than the prevalence of the 0-5 month age group, namely 8.1% (Kementerian Kesehatan RI, 2018).

With regard to the above, non-pharmacological treatment is needed to help increase the baby's weight and prevent malnutrition in infants. Baby massage is part of touch therapy performed on babies so that it can guarantee continuous body contact, maintain a feeling of security in the baby and strengthen the bond between parents and babies: (Roesli, 2013). Cochrane meta-analysis found suggestive evidence that infant massage can increase infant-mother interaction and bonding, improve sleep quality, reduce infant crying, and have a beneficial effect on stress hormones. (Underdown, A *et al.*, 2013).

The growth and development of children is influenced by various factors including genetic factors, the environment since prenatal, natal, postnatal, nutrition includes macronutrients and micronutrients, stimulation and hormones. Hormonal influences include growth hormone, including insulin-like growth factor-1 (IGF-1) (Grissa, O., *et al.*, 2010). *Insulin growth factor-1 (IGF-1)* is a hormone that mediates the effects of growth hormone (growth hormone, GH) and plays an important role in the regulation of somatic growth and organ development (Kamenický *et al.*, 2014). Growth hormone and IGF-1 are often associated with conditions of impaired growth and development because growth retardation occurs when these hormones play an important role in growth. (Myrelid A, 2012) Based on this background, researchers are interested in scientifically proving the effect of baby massage on improving nutritional status (weight/age) and IGF-1, in malnourished infants aged 6-12 months in Mataram city.

METHODS

This study is a quasi-experimental design study with a randomized pre-test and post-test control group design. In the treatment group, infants aged 1-6 months with poor nutritional status were given massage interventions by the baby's mother and daily supplementary feeding (PMT) for 12 weeks. Meanwhile, in the control group, infants aged 1-6 months with poor nutritional status were given PMT alone, no infant massage intervention was given. Measurement of infant weight levels, determination of infant nutritional status and insulin growth factor-1 were carried out before and after the intervention.

The research was carried out in the working area of the Mataram City Health Center – West Nusa Tenggara with the inclusion criteria, namely, malnourished infants aged 1 to 6 months in good health and mothers or families who were willing to participate in the study. The exclusion criteria in this

study were infants with congenital abnormalities and infants with a history of premature, low birth weight (LBW).

Calculation of the number of samples is determined based on previous research (Windiani, 2013). The number of samples required is 48. Sampling was carried out using random sampling, from 48 infants who met the inclusion criteria, random sampling was used to determine the control group (24 people) and the intervention group (24 people).

Prior to the intervention, the parents of the babies who had obtained informed consent and had approved the consent letter to participate in this study were previously given baby massage training and counseling on infant feeding techniques for the intervention group, then the control group was previously given counseling on infant feeding techniques. In the implementation process every day the intervention group ~~did~~ got baby massage by the baby's mother and was given additional food 1 (one) time, and the control group was only given additional food 1 (one) time. Monitoring is carried out daily by researchers and assisted by cadres and midwives in the research area. Observational data collection in the form of weight data and blood sampling were carried out 2 times, before the intervention and after the intervention in each group. Blood collection was carried out by health analysts and the baby's blood serum was stored in the laboratory freezer at the Biomedika Mataram Hospital with a temperature of -40°C. To test the levels of IGF-1 using the ELISA Kit method, it was carried out at the Biochemistry Laboratory of Udayana University.

Data analysis is presented descriptively. Differences in changes in IGF-1 levels and nutritional status, in both groups a non-parametric Wilcoxon test statistical analysis was performed to compare IGF-1 levels and body weight both before and after treatment in both groups with a significance level of 0.05.

RESULTS

The study was conducted on 48 infants with malnutrition criteria which were divided into 2 groups (intervention and control). Each group consists of 24 people. Assessment of nutritional status based on body weight and examination of IGF-1 levels using the ELISA technique, the results obtained include:

Comparability test using the Wilcoxon Test (abnormal distribution data) to determine influence infant massage with supplementary feeding on malnourished infants aged 6-12 months on changes in nutritional status index scores, levels of IGF-1, Serotonin, and Cortisol in both groups before and after the baby massage intervention are presented in Table 1. as follows:

Table 1: Nutrition Status, IGF-1 Before and After Infant Massage in the Intervention Group and Control Group

<u>Variabeles Intervention</u>	Intervention Group	P*	Control Group	P*
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	Average ±SD		Average ±SD	
Nutrition Status				
Before Intervention	-2.56±0.431	0.001	-2.24±1.156	0.033
After Intervention	-1.81±0.664		-1.83±0,89	
IGF-1				
Before Intervention	1.34±0.159	0.001	1.7199±.19563	0.037
After Intervention	4.19±0.240		2.5312±.26248	

Keterangan : P* = Wilcoxon Test is significant at p < 0,05

From Table 1, the nutrition status variable shows an increase in the nutrition status index score after infant massage in both the Intervention Group from -2.56 to -1.81 and the Control Group from -2.24 to -1.83 and shows there is a difference between p=0.001 (p<0.05) in the intervention group and p=0.033 (p<0.05) in the control group. The IGF-1 variable showed an increase in IGF-1 levels in each group with the value before 1.34 increasing to 4.19 in the intervention group and the value before 1.7199 increasing to 2.5312 in the control group and showing a difference p=0.001 (p<0.05) in the intervention group and p=0.037 (p<0.05) in the control group.

Mann-Whitney Test to determine the difference in the increase in nutritional status, IGF-1, serotonin and decreased cortisol between the two groups. The results of the analysis covering Nutritional Status, IGF-1, are presented in Table 2:

Table 2. Nutritional Status (Weight/Age), IGF-1 Infants in the Intervention Group and the Control Group

Variabeles Intervention	Intervention Group Average ±SD	Control Group Average ±SD	p**
Nutrition			
Before Intervention	-2,56±0.431	-2.24±1.156	0.439
After Intervention	-1.81±0.664	-1,83±0,89	0.037
IGF-1			
Before Intervention	1.34±0.159	1.7199±.19563	0.253
After Intervention	4.19±0.240	2.5312±.26248	0.001

Note : p** : Mann-Whitney - test is significant at p < 0,05

Table 2 shows that there is no significant difference in the nutritional status of infants based on the z-score index before the intervention between the intervention group compared to the control group with p value = 0.439 (p>0.05) and after the intervention there is a significant difference in the increase in the z-index. score between the control group compared to the intervention group with a value of p=0.037 (p<0.005).

The IGF-1 variable showed that before the intervention there was no difference in the IGF-1 value between the intervention group and the control group with p value = 0.253 (p > 0.05) but after the intervention there was a significant difference between the intervention group and the control group with a p value = 0.001 (p<0.005).

DISCUSSION

Based on the results above, in the case group (infant massage intervention) there was an increase in nutritional status. The improvement of nutritional status in each group explains that feeding is one of the factors that affect the nutritional status of children under five. Improper feeding can lead to malnutrition and overfeeding can lead to obesity. At the age of 6 months, the baby is physiologically ready to receive additional food, because the function of the baby's digestive tract as a whole has developed (Abrahamse, et al 2012). In addition, at that age, breast milk is no longer sufficient for the needs of the baby's growth and development so that complementary feeding (MP-ASI) is very necessary (Septiana, 2014).

This study analyzes the difference whether infant massage can also improve the nutritional status of infants with poor nutritional status. Based on the Mann-Whitney statistical analysis, there was no significant difference in the nutritional status of infants based on the index score before the intervention between the intervention group compared to the control group with p value = 0.439 ($p > 0.05$) and after the intervention showed a significant difference. an increase in index score between the control group compared to the intervention group with a value of $p = 0.037$ ($p < 0.005$).

Baby massage works to increase the vagus nerve (10th brain nerve) which will cause an increase in levels of absorption enzymes, namely gastrin and insulin (Field, et al, 2008). Thus, the absorption of food will be better and the baby will feel hungry quickly so that he will feed his mother more often. At the age of 6-12 months in this study, breast milk alone was not sufficient to meet nutritional needs. Thus, additional food is given to fill the gap between the total nutritional needs of the child and the amount obtained from breast milk. (Field, T. 2011; Khomsan A, 2013)

Through the techniques in massage, the stimulus given to the baby's skin can be directly sent to the exteroceptor as a sensory terminal in the skin. The stimulus will induce the flow of blood, lymph, and fluid in the subcutaneous tissue. Massage can also increase the tone of the vagus nerve (vagal stimulation), where one branch of the vagus nerve will invert the gastrointestinal tract. The vagus nerve is a key component in the regulation of the autonomic nervous system and socioemotional function, which can innervate most organs in the body, including the digestive and cardiovascular systems. Increased vagal activity with massage will trigger digestive tract motility, stimulate gastric emptying, increase gastric and pancreatic secretions so that gastrin and insulin hormone production increases (Bennet et al, 2013). The baby will be stimulated to suckle more, the amount of food intake in the intestine increase increases so that it can bind more bilirubin for easy excretion (Field, 2017)

Baby massage in this study was carried out directly by the baby's own mother every day, this proves that when baby massage was carried out at the time of observation, it increased positive interactions between mother and baby, thereby increasing the mother's response to the baby's hunger and making it easier to immediately breastfeed and provide food and drink—~~on~~ for her baby. Several studies have proven that this baby massage enhances the response between mother and baby (Rahmatnezhad et al, 2018; Riem et al, 2021). Another study concluded that applying massage therapy had a positive effect on the physical, physiological and behavioral conditions of premature neonates, in

addition to increasing body weight but also reducing the length of hospital stay (Bayomi & Nagger, 2015).

Based on the Mann-Whitney statistical analysis test, before the intervention there was no significant difference in IGF-1 values between the intervention group and the control group with p value = 0.253 ($p > 0.05$) but after the intervention showed a significant difference between the intervention group and the control group. Control group with $p = 0.001$ ($p < 0.005$).

Insulin growth factor (IGF-1) plays an important role in growth and development, as well as overall regulation and metabolism in the human body. This IGF-1 is produced by the liver under growth hormone stimulation, and has a systemic growth effect. Maternal serum IGF-I is significantly associated with GA, maternal BW, and BMI during pregnancy (Moler, 2011; Ming, *at.al* 2013).

Several studies that have been conducted have linked increased IGF-1 with greater weight gain. The same thing happened with the results of this study, namely the intervention and control groups showed a significant difference in the average levels of IGF-1 ($p = 0.002$) or ($p < 0.05$) which indicated that infant massage increased IGF-1 levels in status infants. undernourished aged 6-12 months. Moderate pressure massage stimulates the vagus nerve (one of the 12 cranial nerves in the brain) which causes vagal activity to increase and in turn increases gastric motility (movement of the gastrointestinal tract) and the release of insulin (food absorption hormone) and IGF-1 which play an important role in stimulating growth (Field, *at.al* 2012).

The secretion of IGF-I and insulin is stimulated by food intake and inhibited by fasting, the main biological similarities between these systems. This review covers the hepatic metabolic effects of IGF-I on carbohydrate and fat metabolism and their possible effects on body fat accumulation. (Ohlsson, *at.al* 2009).

The noted increase in vagal activity, gastric motility, insulin and IGF-1 following moderate pressure massage is a potential underlying mechanism.¹⁹ Insulin-like growth factor (IGF-1) plays an important role in growth and development, as well as regulation and overall cellular metabolism. in the human body. IGF-1 levels rise sharply during pregnancy. A study found the mean maternal serum IGF-1 level in the first trimester of pregnancy was 93.8 ± 44.2 ng/ml; second trimester 145.7 ± 104.6 ng/ml; and in the third trimester 202.5 ± 140.8 ng/ml.¹⁵⁻²⁰ Previous research There is a relationship between IGF-1 levels with WAZ, WHZ, growth line direction, gross motor development, and fine motor skills in Down syndrome children. (Arifiyah., Purwanti, Asri. 2017).

CONCLUSION

There is a significant difference in the increase in infant nutritional status and IGF-1 in infants stimulated by infant massage compared to infants who were not given infant massage stimulation in malnourished infants aged 6-12 months. Stimulation of baby massage It is necessary to develop further research, namely infant massage with a combination of acupressure in order to further increase the response of the HPA axis as an effort to increase body weight. Education to parents, health workers

about the benefits of baby massage on improving the nutritional status of infants, increasing levels of IGF-1, in malnourished infants aged 6-12 months can be done with various counseling techniques and educational media.

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