



The Relationship Between Kinesthetic-Tactile Stimulation and Growth in Low Birth Weight Infants at Waled Regional General Hospital, Cirebon Regency

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KEYWORDS

LBW, TKS, Tactile kinesthetic stimulation.

ABSTRACT

Low birth weight (LBW) is defined as a newborn baby weighing less than 2500 grams regardless of gestational age. Based on WHO 2020 data, there were 19.8 million newborns, with around 14.7% of all babies born globally that year classified as LBW. LBW conditions cause the body's organs to be unable to function perfectly, making the adjustment of organ function to changes from intrauterine to environmental conditions outside the womb very difficult for these babies. There are factors that can increase the weight of LBW babies, one of which is *Tactile Kinesthetic Stimulation* (TKS). This study aims to analyze the correlation between the provision of tactile kinesthetic stimulation and the growth of low birth weight infants at *Waled General Hospital*, Cirebon District. This research uses an analytical observational method with a cross-sectional design from secondary data in the form of medical records, with a sample size of 60 babies obtained by total sampling. Data were tested using Spearman's rho. The results of the analysis showed a correlation between the provision of tactile kinesthetic stimulation and the weight growth of LBW babies (p -value = 0.001) with $r = 0.874$. There is a significant correlation between the provision of tactile kinesthetic stimulation and the growth of low birth weight infants at *Waled General Hospital*, Cirebon District.

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INTRODUCTION

Low birth weight (*Berat Badan Lahir Rendah* or *BBLR*) is defined as a newborn with a body weight of less than 2500 grams regardless of gestational age. *BBLR* is included in the category of high-risk infants that not only cause complications in neonates but is also a high-risk factor for growth and developmental disorders, which can be indicated by the physiological responses and behaviors of the infant. *BBLR* has become an important public health issue both nationally and globally, associated with short-term and long-term impacts (World Health Organization, 2022).

Based on combined data from the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) in 2020, there were 19.8 million newborns, with around 14.7% of all babies born globally that year being *BBLR* (United Nations Children's Fund-World Health Organization, 2023). According to the results of *Riskesmas* in 2018, out of 4.81 million births, 6.2% were born with *BBLR* (Kementrian Kesehatan Republik Indonesia, 2018). According to the West Java Health Office in 2020, the number of births in West Java was 789,541 babies, with a percentage of *BBLR* of around 10.2% (Dinas Kesehatan Provinsi Jawa Barat, 2021). The incidence rate of *BBLR* in Cirebon City, according to the Cirebon City Health

Office in 2021, was 3.7% (207 cases), while cases in Cirebon Regency, according to the Cirebon Regency Health Office in 2021, reached 35 cases (50.72%) (Dinas Kesehatan Kota Cirebon, 2021).

Low birth weight (*BBLR*) is most often caused by premature birth (*kelahiran prematur*), which occurs before 37 weeks of gestation. Premature babies have less time in the mother's womb (*uterus*) to grow and gain weight. In addition, some risk factors for *BBLR* include pregnant women who are <20 or >35 years old, pregnancy intervals that are too short, mothers with a previous history of *BBLR*, heavy physical work, lack of nutrition, smoking, consumption of illegal drugs, alcohol consumption, anemia, preeclampsia or hypertension, infections during pregnancy, and multiple pregnancies (Damayanti et al., 2022).

Complications that can occur due to *BBLR* include low oxygen saturation at birth, body temperature below normal (36.6°C--37°C), obstacles to growth and development, infections, breathing problems and immature lungs, indigestion, and Sudden Infant Death Syndrome (SIDS) (Stanford Medicine Children's Health, 2020).

BBLR conditions cause the body's organs to be unable to function perfectly, so adjusting organ function to changes in conditions from intrauterine to environmental conditions outside the womb is very difficult for babies. The interventions needed in *BBLR* are to maintain normal body temperature, meet the nutritional needs of the baby, and most importantly, increase the baby's weight. There are factors that can increase the weight of *BBLR* babies, namely by means of *kangaroo mother care* (*Metode Perawatan Dini* or *MPD*), breastfeeding, and tactile kinesthetic stimulation (Afian et al., 2021).

Tactile Kinesthetic Stimulation is a term for massage therapy, which is one of the effective interventions. *Tactile Kinesthetic Stimulation* is carried out by providing moderate pressure massage therapy consisting of flexion and extension of the legs in a supine position that helps increase the weight of the *BBLR* baby. This tactile kinesthetic stimulation mechanism involves giving gentle massage to the baby to produce beta-endorphins that affect the baby's growth and development mechanisms; the activity of the vague nerve affects the mechanism of food absorption, which is related to the increase of gastrin and insulin enzymes and insulin production, which can increase immunity (Shah & Singaravelan, 2019).

Tactile Kinesthetic Stimulation is the therapy of choice applied to *BBLR* babies in the NICU by various developed countries. *Tactile Kinesthetic Stimulation* can not only be done by medical personnel, but mothers can also provide massage stimulation independently at home, which can reduce medical costs or be more economical. In addition to being more economical, this tactile kinesthetic stimulation therapy does not have serious side effects, does not use drugs, is easy to perform, and is accepted by the patient and the patient's parents (Lotfalipour et al., 2019).

Research conducted by Yunengsih (2021) stated that there was an effect of *BBLR* massage on the weight of *BBLR* babies in the intervention and control groups with a p-value of 0.000 each. Another study conducted by Yusniarita et al. (2021) reported that there was an increase in growth and development after kinesthetic tactile stimulation intervention in infants with a history of *BBLR* with a p-value < 0.05, meaning that the provision of kinesthetic tactile

stimulation carried out by modifying infant massage with infant gymnastics can influence the growth and development of infants with a history of *BBLR*.

Based on the above background, this study aims to analyze the relationship between tactile kinesthetic stimulation and the growth (weight gain) of low birth weight infants at *Waled Regional General Hospital*, Cirebon Regency. It is hoped that the results of this research can provide scientific evidence regarding the effectiveness of TKS as a non-pharmacological intervention to accelerate weight gain in LBW infants. The benefits of this research are expected to contribute to clinical practices in neonatal care, especially in efforts to reduce infant mortality rates and complications due to LBW, as well as serve as a reference for further research and health education for parents of LBW infants. The researcher is interested in conducting this research because studies on this topic are still limited, particularly in the setting of *Waled Regional General Hospital*, Cirebon Regency.

METHOD

Research Design

This research was carried out at *Waled Regional General Hospital*, Cirebon Regency, West Java Province. The time frame for the study was from June to July 2024. This study was conducted using an analytical observational research design with a cross-sectional approach to determine the relationship between tactile kinesthetic stimulation and the growth of low birth weight babies at *Waled Regional General Hospital*, Cirebon Regency. The data collection technique involved secondary data in the form of medical records. The sample size included *BBLR* babies born from January to December 2023. The data obtained consisted of 60 *BBLR* babies, comprising 30 male and 30 female infants. Data taken from the medical records included gender, birth weight, and body weight after 7 days.

Measurement

Samples were taken according to the inclusion criteria, namely: (1) *BBLR* babies of both male and female genders, (2) *BBLR* babies with a birth weight of 1500–2500 grams, (3) full-term and preterm (*under-month*) *BBLR* babies, and (4) *BBLR* babies who were given breast milk.

Sample data collected during the study included infant birth weight, infant weight at 7 days, and tactile kinesthetic stimulation provided to the infants.

The independent variable in this study was tactile kinesthetic stimulation, measured on a nominal scale with responses categorized as yes or no. The dependent variable in this study was the weight gain of *BBLR* babies, measured on an ordinal scale with results categorized as: (1) weight increase below standard, and (2) weight increase above standard (10 g/day).

Statistical Analysis

Univariate analysis in this study was used to describe each variable studied, namely tactile kinesthetic stimulation and weight gain of *BBLR* babies. Bivariate analysis aimed to examine the relationship between these two variables. The data were tested using a non-parametric statistical test, specifically Spearman's rho correlation test, utilizing computer software.

Ethical Clearance

This research was conducted at *Waled Regional General Hospital* and has been approved by the Health Research Ethics Committee of *Waled Regional General Hospital* with approval number 000.9.2/061/KEPK/V/2024.

RESULT AND DISCUSSION

Respondent Characteristics

Based on the results of the frequency distribution in table 1, it shows that the male BBLR respondents are 30 infants (50.0%) and the female BBLR respondents are 30 infants (50.0%). Table 2 shows that the initial weight of the smallest BBLR baby is 1525 grams and the largest body weight is 2350 grams. The increase in weight of BBLR babies after 7 days was obtained the smallest which was 1545 grams and the largest was 2450 grams.

Table 1. Distribution Based on Respondent Characteristics

Characteristics	N (%)
Gender:	
Men - men	30 (50.0)
Woman	30 (50.0)
Total	60 (100.0)

Source: Secondary data of medical records of Waled Hospital, 2023

Table 2. Characteristics of Initial Weight of Babies BBLR

Characteristics	Grams
Initial Weight :	
Smallest	1525
Largest	2350
Weight Loss After 7 Days :	
Smallest	1545
Largest	2450

Source: Secondary data of medical records of Waled Hospital, 2023

Univariate Analysis

Table 3. Frequency Distribution of Tactile Kinesthetic Stimulation

Giving Tactile Kinesthetic Stimulation	N	%
Ya	30	50.0
No	30	50.0
Total	60	100.0

Source: Secondary data of medical records of Waled Hospital, 2023

Based on table 3, it shows the provision of tactile kinesthetic stimulation to BBLR babies. There were 30 (50.0%) respondents who were given tactile kinesthetic stimulation and 30 (50.0%) respondents who were given tactile kinesthetic stimulation were given BBLR babies who were not given tactile kinesthetic stimulation.

Table 4. Frequency Distribution of Infant Weight BBLR

Baby Weight BBLR	N	%
Weight gain below standard	30	50.0
Weight gain above standard	30	50.0
Total	60	100.0

Source: Secondary data of medical records of Waled Hospital, 2023

Based on table 3 above, it shows the increase in weight of BBLR babies. There were 30 (50.0%) respondents in the BBLR category who were included in the weight category and 30 (50.0%) respondents were included in the weight category.

Bivariate Analysis

Table 5. Weight gain in BBLR babies who were given tactile kinesthetic stimulation and were not given tactile kinesthetic stimulation for 7 days

Characteristics	N	Mean	Percentage
Provided Tactile Kinesthetic Stimulation	30	96,5	5,3%
Not Given Tactile Kinesthetic Stimulation	30	22,3	1,2%

Source: Secondary data of medical records of Waled Hospital, 2023

Based on table 5 above, it shows a picture of weight gain in BBLR babies who were given tactile kinesthetic stimulation and not given tactile kinesthetic stimulation. Of the 60 babies who were sampled, 30 babies who were given tactile kinesthetic stimulation experienced weight gain with an average increase of 96.5 grams (5.3%) in 7 days. Meanwhile, in babies

Tactile Kinesthetic Stimulation	BBLR Baby Weight Growth		Total	P value	R
	Rising below standard	Rising above the standard			
Ya	N	0	30		
	%	0.0%	100.0%	100.0%	
No	N	30	0	30	0,001
	%	100.0%	0.0%	100.0%	0,874
Total	N	30	30	60	
	%	50%	50%	100.0%	

who were not given tactile kinesthetic stimulation, weight gain was obtained with an average addition of 22.3 grams (1.2%) in 7 days. This shows that babies who are given tactile kinesthetic stimulation have a weight gain of approximately 10 grams per day.

Table 6. The Relationship of Tactile Kinesthetic Stimulation with the Growth of Low Birth Weight Babies

Source: Secondary data of medical records of Waled Hospital, 2023

Based on table 6, the weight growth of BBLR babies who were given tactile kinesthetic stimulation with the category increased by 30 babies (100.0%) and the weight growth of BBLR babies who were not given tactile kinesthetic stimulation with the fixed weight category was 30 babies (100.0%).

In the Spearman rho test, a p-value < 0.05 was obtained, which is 0.001. Therefore, based on the test criteria above, it is concluded that there is a relationship between the administration of tactile kinesthetic stimulation and the growth of BBLR babies with a positive correlation direction and a very strong correlation strength.

Tactile Kinesthetic Stimulation

Based on the results of the distribution of tactile kinesthetic stimulation, it was known that there were a total of 60 samples with 30 respondents given kinesthetic stimulation (50%) and 30 respondents who were not given tactile kinesthetic stimulation (50%). The administration of tactile kinesthetic stimulation aims to help increase the growth of the baby, one of which is in weight gain (Puji Lestari et al., 2021).

Tactile kinesthetic stimulation provides benefits for brain development, reduces stress reflected in lower serum cortisol levels, increases body weight, decreases pain response, improves digestion, lowers energy expenditure, increases temperature to prevent hypothermia, stabilizes the breathing rate of newborns, improves infant behavior related to his physical health, and improves the maturation of electroencephalographic activity, vision function, neurological, and motor development (Puji Lestari et al., 2021).

Based on research conducted by Nazera Iskandar et al. (2019), Kangaroo Method Treatment (PMK) is a standard surgical procedure provided by hospitals for premature birth and has been proven to effectively improve infant growth and development as well as physiologically. However, this treatment is less efficient in the process of reducing the length of hospital stay. Data show that babies' weight increases significantly day by day only if premature neonates receive Tactile-Kinesthetic Stimulation. However, this study noted that the weight of premature babies in the control group who were only given FMD decreased slightly at 35.69 grams on the third day of observation.

Weight Gain for Babies BBLR

Based on the results of the distribution of BBLR infant weight gain, it is known that there were 60 samples with 30 infants experiencing weight gain after being given tactile kinesthetic stimulation with an average addition of 96.5 grams (5.3%) in 7 days and 30 infants who were not given tactile kinesthetic stimulation had an average weight gain of 22.3 grams (1.2%) in 7 days. Weight is one of the anthropometric measures that is often used at every health examination in infants, children, and even adults to determine growth and nutritional status.

Growth is an increase in physical size and body structure partially or completely so that it can be measured in units and weight. Birth weight is an important indicator of the baby's health because it is the main factor for the survival and development and mental development of the baby in the future. Biologically all babies experience weight loss in a short period of

time after birth, which can be affected by the state of illness and increased energy consumption. The weight gain of babies with a history of BBLR increased 5% more than babies born with normal weight. BBLR will catch up to the weight until the age of 47 months, and will be 2 kg heavier than other babies. In the second week of birth, the baby will experience a weight gain of 10 -- 20 g/kg/d (1-3% of body weight per day) (Abidanovanty et al., 2023).

Weight gain can be influenced by several factors, namely genetics, breastfeeding, and interventions such as kangaroo method treatment and tactile kinesthetic stimulation. Breast milk is one of the factors that affect the nutritional status of babies aged 0-6 months. WHO recommends exclusive breastfeeding for up to 6 months, even babies with BBLR and BBLSR are strongly recommended because they will increase body weight by about 20 grams per day. Kangaroo Method Treatment (PMK) is another factor that can increase the weight of BBLR babies. FMD is an alternative to incubators because it improves the psychological and emotional experience of babies. Babies with FMD feel comfortable and warm in the mother's arms so that vital signs can be more quickly stabilized, circulation is smooth and helps metabolism which can increase weight (Yulizawati & Afrah, 2022).

The Relationship of Tactile Kinesthetic Stimulation with the Growth of Low Birth Weight Babies

Based on the results of data analysis, it is known that the administration of tactile kinesthetic stimulation can increase the weight of BBLR babies, which is as much as 30 respondents (50%). The results of the hypothesis test with Spearman rho for the relationship between tactile kinesthetic stimulation and weight growth had a p-value of $< \alpha$, which was $0.001 < 0.05$. This means that there is a significant relationship between the provision of tactile kinesthetic stimulation and the increase in weight of BBLR babies, and the results of $r = 0.874$ are obtained, namely the strength of correlation is very strong, with a positive research direction which means that the higher the provision of tactile kinesthetic stimulation, the higher the increase in weight of BBLR babies.

This finding is in line with the results of the research of Atika et al. (2024) which stated that there was an increase in the weight of BBLR babies who were given stimulation of baby massage. Although the group of babies who were not given stimulation experienced weight gain, the babies who were given massage stimulation had a significant increase in weight. This study is not in line with the research of Fauziah and Wijayanti (2018) that there is no effect between infant massage on weight gain. Theoretically, babies do have weights that vary based on their age. The increase in infant weight is also greatly influenced by various factors, both internal and external. The results of this study are supported by research conducted by Elmoneim et al. (2020) where when infants are given tactile kinesthetic stimulation, not only significantly increases growth in both weight, body length, and head circumference but the stimulation can also increase total body mass, fat mass, and bone mineral density. The results of this study are also similar to the research conducted by Lola Fauzia et al. (2022) where tactile stimuli are one of the stimuli to optimize the development of neonates. Although there was an

improvement between the control group and the experimental group, the development of neonates in the experimental group was higher.

Tactile kinesthetic stimulation is one of the interventions that can be used to increase the growth of low-birth weight babies. One of the benefits of tactile kinesthetic stimulation is that it can reduce stress, increase cortisol secretion and the secretion of the hormone melatonin in newborns. Increased levels of the hormone melatonin make babies feel better, improving sleep patterns and increasing their weight (Novitasari et al., 2020).

Research Limitations

The findings in this study must still be considered considering the limitations in the study. First, the number of samples is small because the number of BBLR babies is not always the same every year. Second, there are confounding variables or intermediate variables that are not studied and can affect the results of the research. Third, the frequency of tactile kinesthetic stimulation has not been studied, which can cause bias in the research results. Fourth, it is not known whether BBLR babies in the perinatology room are given nutrients other than breast milk. Fifth, the limited research time so that it cannot follow the growth of BBLR babies for longer in order to strengthen the research results.

CONCLUSION

The results of this study can be concluded as follows: the gender distribution of *BBLR* babies at *Waled Hospital* in 2023 was equal between male and female infants. The number of babies given tactile kinesthetic stimulation in 2023 was only 50%. The babies' weight was reported to have increased above the standard by 50%. The weight gain of *BBLR* babies who received tactile kinesthetic stimulation was approximately 10 grams per day, and there was a significant relationship between the administration of tactile kinesthetic stimulation and the growth of low birth weight babies. For future researchers, it is hoped that this research can be continued using a prospective cohort method over a longer period to strengthen the findings. For health services, it is hoped that future efforts will include counseling and socialization that emphasize the importance of tactile kinesthetic stimulation to parents of *BBLR* babies. For the public, it is hoped that this study can provide valuable information on the importance of managing *BBLR* babies with tactile kinesthetic stimulation methods, thereby increasing public awareness of its positive influence on the growth of *BBLR* babies.

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