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THE IMPACT OF GENTLE HUMAN TOUCH IN INCREASING BABY WEIGHT, BODY TEMPERATURE AND PULSE STABILITY ON PRETERM BABY

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ABSTRACT
Background: Touch is crucial for optimal growth and development of preterm babies. Gentle human touch is considered as a complementary treatment to spur their growth and development.
Objective: To determine the effect of gentle human touch on weight gain, body temperature and pulse rate stability in preterm babies.
Methods: This was a Randomized Controlled Trial (RCT) with pretest-posttest with control group. Thirty-nine respondents were selected by consecutive sampling, assigned into two treatment groups and one control group. Data were analyzed using MANOVA .
Results: The results showed that there was statistically significant difference in body weight (p = 0.047), body temperature (p = 0.021), and pulse rate stability (p = 0.001) in preterm babies.
Conclusion: Gentle human touch therapy twice a day is more effective in improving body weight, body temperature, and pulse rate stability in premature babies. It is recommended that gentle human touch be applied as an operational standard for premature baby care.

Keywords: premature babies, gentle human touch, body weight, body temperature, and pulse rate stability

INTRODUCTION
The number of premature babies is increasing. WHO stated that one in ten births is a premature baby.[1] In Indonesia, it is estimated that approximately 350,000 infants or 7-14% were born prematurely or in low birth weight,[2] which is still relatively high compared to some developing countries that have 5-9% of

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preterm infants, 12-13% in the United States.[3,4]

One of the highest incidence rate of premature and low birth weight (LBW) infants is in the province of West Sumatera.[2] Pariaman city is a contributor of 10% of premature cases in this province.[2] The General Hospital of Pariaman recorded data of premature infants and low birth weight in 2007 as much as 5.1% of cases, which is increased to 7.7% in 2008 and 11.4% in 2013.[5] This percentage remains steadily in 2014, which was 11.7% in 2014, and drastically increased to 19.5% in 2015.[5] Report from Perinatology ward of the General Hospital of Pariaman between January to July 2016 indicated that as many as 113 of 493 babies (22.9%) are prematures.[5]

Premature infants are babies born with gestation less than 37 weeks and with low body weight.[6] In premature infants, the maturation of all organs has not been achieved properly. Thus, they are at risk of health problems. Due to birth weight less than 2500 grams, the baby does not have or only have a few subcutaneous fat deposits, limited brown adipose tissues, and weak sucking reflexes and swallowing.[7]

In addition, premature babies are required to be treated in incubators, as low-weight babies do not yet have the ability to adapt to ambient temperatures. The incubator is useful for keeping the baby's temperature steady, due to an inadequate regulatory system in the premature infant body, which may compromise his or her health condition.[8] Another problem that often arises is in the respiratory system, since premature babies are in need of higher oxygen, which is three times more compared to babies who are old enough.[9] Thus, these conditions tell the treatment of premature infants should be performed well.

The intervention that has been done in the General hospital of Pariaman shows is still conventional, which is to let the baby in the incubator, provide the usual care, prepare milk as needed, minimally hold the baby, allow the baby to grow by themselves, and perform physician advice. These interventions might be good enough, but alternative treatment should be performed to support the growth and development of the babies.

According to literature, various interventions for premature infants are being developed to spur growth and development and shorten the duration of treatment, such as tactile, kinesthetic, vestibular, oral, auditory and other stimulations, which are required for extrauterine development of premature infants as well as helping infants adapt to the extrauterine environment.[10] The intervention proposed in this study is touch therapy (Gentle Human Touch).

Studies show that Gentle Human Touch will produce beta endorphin that affects future growth mechanisms in infants.[11] In Gentle Human Touch, infants experience increased vagus nerve tone (10th nerve brain), which will lead to increased levels of gastrin absorption enzyme and insulin secretion, thereby better absorption of food, so that the weight of infants receiving touch therapy increases more than those without it.[11] Therefore, this study aims to determine the effect of Gentle Human Touch on weight gain, body temperature, and pulse rate stability in preterm babies.

METHODS

Design

This Randomized Controlled Trial (RCT) was conducted in the General Hospital of Pariaman, West Sumatera Province in between October 2016 and January 2017.

Sample

Thirty nine respondents were selected using consecutive sampling method, which randomly assigned to three groups, namely: 1) treatment A group who received gentle human touch once a day for 15 minutes (13 respondents), 2) treatment B group who received gentle human touch twice a day for 15 minutes per each intervention, and 3) control group (13 respondents) received Kangaroo Mother Care (KMC) once a day for 30 minutes.

The inclusion criteria to select sample were: a) Infants with gestational age ranged between 28 weeks to less than 37 weeks, b) Infant birth weight before intervention was from 1400 grams to 2500 grams, c) infants who had no congenital abnormalities based on medical records, d) premature infants who did not receive oxygen therapy either by O2 hose, ventilator, or CPAP (Continuous Positive Airway Pressure), e) no dehydration based on medical records, f) Incubator temperature and food intake were adjusted based on the needs according to age and weight of each premature infant and standard of the hospital, g) no experience complications such as respiratory distress syndrome, anemia, intracranial hemorrhage, Necrotizing enterocolitis (NEC), Patent Ductus Arteriosus (PDA), active infection, and prematurity apnea (characterized by baby blue skin, increased respiratory frequency and the presence of chest wall).

The exclusion criteria in this study included: a) the infant underwent phototherapy treatment or transfusion exchange, b) experienced vomiting / regurgitation during the course of the intervention, and c) the infant's parents asked for forced return home during the intervening period.

Intervention

In this study, the treatment A group received gentle human touch once a day for 15 minutes, treatment B group received gentle human touch twice a day for 15 minutes per each intervention, and the control group received Kangaroo Mother Care (KMC) once a day for 30 minutes. A gentle human touch therapy is an act or activity performed by practitioners or therapists on premature infants, involving physical contact, with slow and gentle movements using herbal massage oil in the area of head, shoulders, back, hands and feet. This therapy consisted of 3 phases. The first and the third phases are called tactile stimulation, and the second phase is called kinesthetic stimulation. Intervention was performed for 1 hour after morning and evening bath for 5 days intervention. The implementation of touch therapy (Gentle Human Touch) was carried out by the researchers themselves who had competency and certified. For control group, KMC (Kangaroo Mother Care) was given as a treatment for premature babies by making skin-to-skin contact between the baby’s front and the mother’s chest. Implementation of KMC was performed by the infant mothers with the help of researchers and enumerators.

Instrument

Body weights were measured by researchers using digital scales in grams. Temperature was measured using a digital thermometer with a normal temperature ranged between 36.5 ° C - 37.5 ° C, and pulse rates were measured using pulse oximetry with normal pulse of 120 – 160 beats per minute.

Ethical consideration

The research has been ethically approved by Politeknik Kesehatan Kementrian

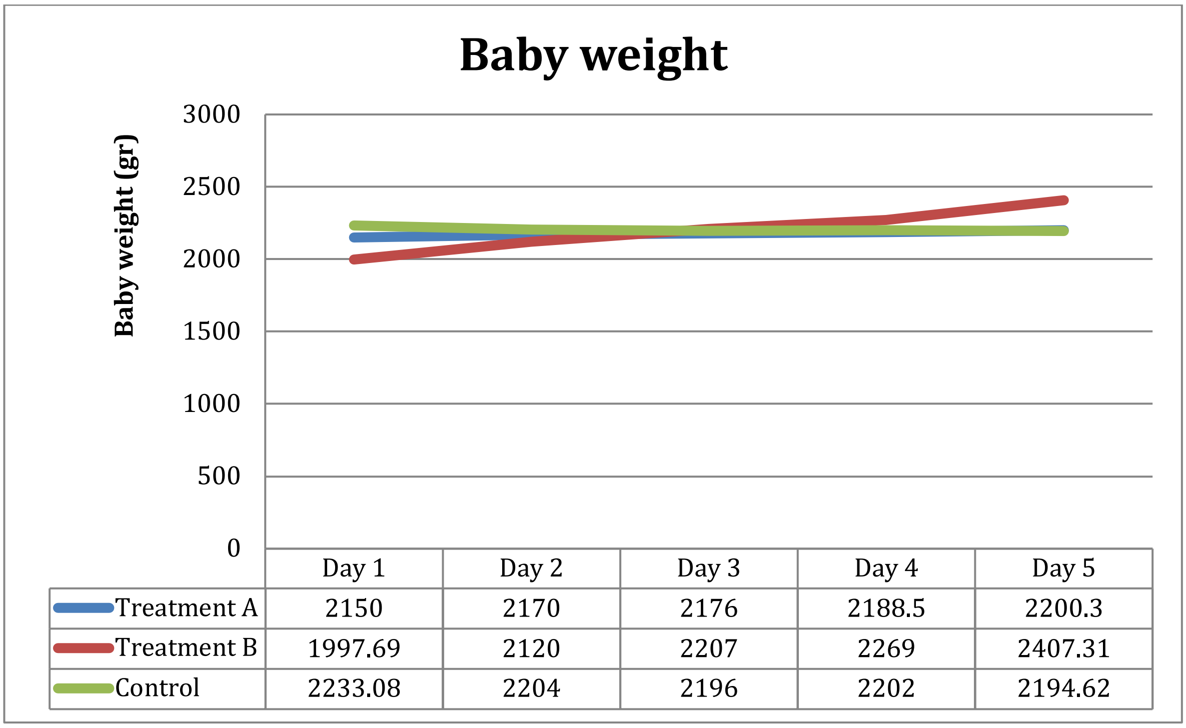
Kesehatan Semarang with No. 222/KEPK/ Poltekkes-SMG/EC/2016. The study permission was also obtained from the Director of the General Hospital of Pariaman. Informed consent was conducted on all respondents' mothers by explaining the purpose, benefits, duration of study, procedures and responsibilities of the participants. It was also explained that the confidentiality of the data was highly addressed, and the compensation was provided for the respondents.

Data analysis

Univariate and bivariate analyses were performed in this study. The univariate analysis was to describe each of the variables studied in the study using descriptive statistics, while bivariate analysis using ANOVA and MANOVA to examine the effect of interventions and determine which intervention is the best among all the interventions provided.

RESULTS

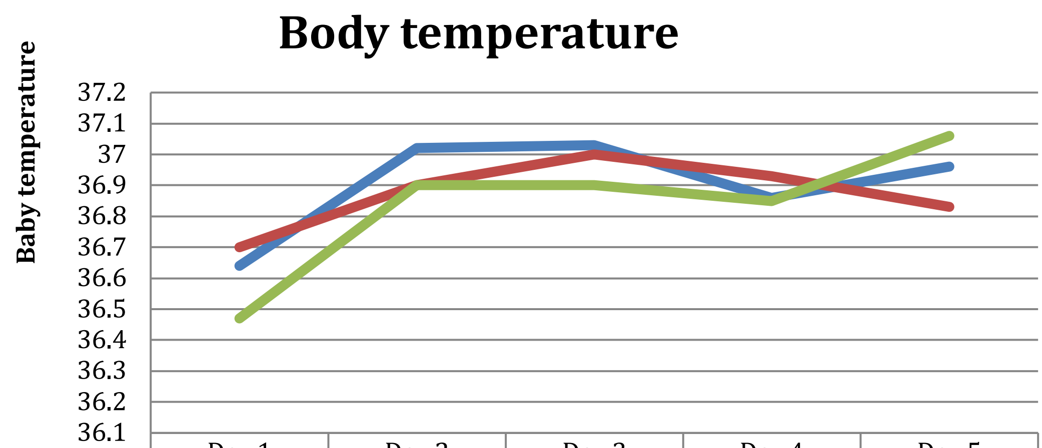
Characteristics of the respondents



	Day 1	Day 2	Day 3	Day 4	Day 5
Treatment A	2150	2170	2176	2188.5	2200.3
Treatment B	1997.69	2120	2207	2269	2407.31
Control	2233.08	2204	2196	2202	2194.62

Graphic 1 Frequency distribution of baby weight in the treatment and control group

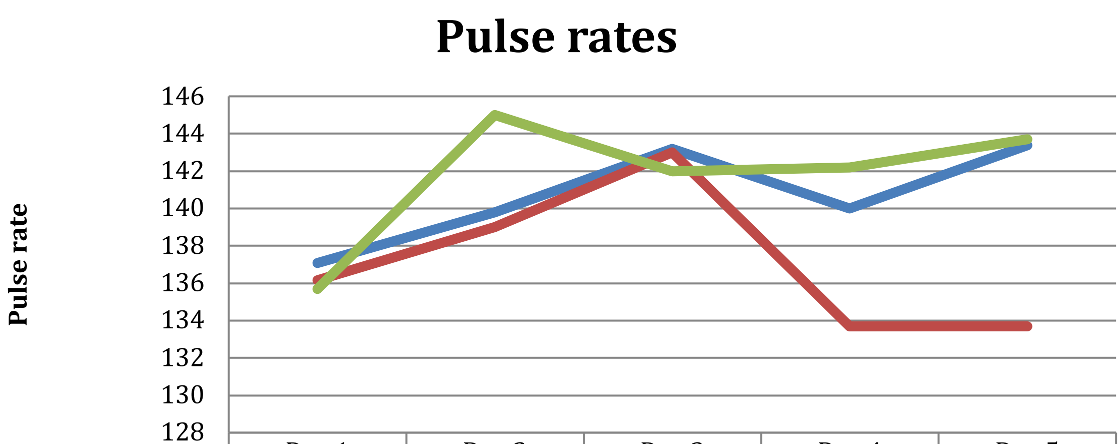
As shown in the graphic 1, the average weight on the treatment B on the first day was 1997.69 gr and the average body weight on the fifth day was 2407.31 gr. There was an increase of 409.62 gr in five days.



	Day 1	Day 2	Day 3	Day 4	Day 5
Treatment A	36.64	37.02	37.03	36.86	36.96
Treatment B	36.7	36.9	37	36.93	36.83
Control	36.47	36.9	36.9	36.85	37.06

Graphic 2 Frequency distribution of baby temperature in the treatment and control group

Graphic 2 shows that the mean temperature in the treatment B on the first day was 36.7 ° C and increased to be was 36.83 ° C on the fifth day. There was an increase of 0.13 ° C in five days.



	Day 1	Day 2	Day 3	Day 4	Day 5
Treatment A	137.08	139.8	143.2	140	143.38
Treatment B	136.15	139	143	133.7	133.69
Control	135.69	145	142	142.2	143.69

Graphic 3 Frequency distribution of baby pulse rates in the treatment and control group

Graphic 3 shows that the average pulse in the treatment B on the first day was 136.15 beats per minute, decreased to 133.69 on the fifth day. There was a decrease of 2.46 in five days.

Table 1 Effect of Gentle human touch on weight, temperature, and pulse rates in preterm infants

Variable	Group	*Pre*	*Post*	*Delta*	*P-value*		*Post Hoc*		
Body weight	Treatment A	2150	2200.38	50.3	0.047*		Treatment A	Treatment B	0.034
	Treatment B	1997.69	2407.31	409.62			Treatment B	Control	0.029
	Control	233.08	2194.62	-38.46					
Body temperature	Treatment A	26.64	36.96	0.32	0.021*	0.000**	Treatment B	Control	0.006
	Treatment B	36.70	36.83	0.138					
	Control	36.47	37.06	0.599					
Pulse rate	Treatment A	137.08	143.38	6.3	0.001*		Treatment A	Treatment B	0.001
	Treatment B	136.15	143.69	-2.46			Treatment B	Control	0.001
	Control	135.69	143.68	8					

**ANOVA **MANOVA Significant value <0.05*

Table 1 shows that there was statistically significant difference among the treatment A, treatment B, and control group in terms of body weight (p= 0.047), temperature (p= 0.021), and pulse rate (p= 0.001). This finding was supported by the result of MANOVA test, which showed p-value 0.000, indicated that there was a significant effect of gentle human touch on body weight, body temperature and pulse rates.

Based on the descriptive statistic test, it could be seen the effectiveness of the treatment B, which showed that the body weight in the treatment B group was higher compared to the body weight of the other groups. Similar with the body temperature and pulse rates, the treatment B group showed the significant decrease of temperature and pulse rates than the other groups.

DISCUSSION

This study aimed to determine the effect of Gentle Human Touch on weight gain, body temperature and pulse rates in premature infants. Findings of the study showed significant effects of this treatment statistically on infant weight gain, body temperature and pulse rates stability.

The increase of weight gain in premature infants after given gentle human touch is due to the production of endorphin beta that can affect future growth mechanisms in infants.[12] The impact of this therapy increases the vagus nerve tone (10th nerve brain) which lead to increased levels of enzyme absorption of gastrin and insulin secretion, thus the absorption of food will be better.[13]

Human touch also stimulates blood circulation and increases energy because more oxygen is sent to the brain and throughout the body. Improved sleep quality in infants given the touch is due to an increase in serotonin secretion levels produced during the therapy.[13] In addition, a gentle suppression by the mothers to the baby causes the nerve endings on the surface of the skin reacted to the touch. Furthermore, the nerve sends messages to the brain through the neural network located in the spinal cord. The process may cause stimulation of peripheral sensory nerve receptors, especially pressure receptors.[13] This stimulation activates the parasympathetic nervous system. The most important parasympathetic nerve stimulation involved in sleep processes is that some areas within the parasympathetic autonomic nerve of raphe nuclei and nucleus tractus solitarius, which are the sensory regions of the medulla and the pons passed by the visceral sensory signals entering the brain through the vagus and glosovaryngeal nerves.[14]

Gentle human touch also increases vagal tone to stimulate the vagus nerve. The supply of parasympathetic nerves is delivered to and from the abdomen through the vagus nerve.[13,14] Vagus nerve is the nerve of the tenth head that regulates the function of organs including the chest and abdomen. Stimulation of the vagus nerve stimulates enterochromaffin cells in the gastrointestinal tract to secrete the hormone serotonin.[13,14]

Theoretically, it can be explained that in humans more than 90% of serotonin in the body is found in enterochromaffin cells in the gastrointestinal (duodenal) channel. The enterochromaffin cells are the principal synthesis and storage site of serotonin in the body. Serotonin is also found in the raphe cells in the brain stem, there are serotoninergic neurons that synthesize, store, and release serotonin as neurotransmitters.[14] Serotonin can induce drowsiness and provide comfort (antidepressant). The release of serotonin is stimulated by the presence of food and stimulation of the vagus nerve. Serotonin is the major neurotransmitter associated with the onset of sleep by suppressing the activity of the reticular activation system as well as other brain activity.[14]

Serotonin synthesized from the tryptophan amino acid is converted to 5-hydroxytriptophan (5HTP) then becomes N-acetyl serotonin which eventually turns into melatonin. Melatonin has a role in sleep and makes sleep longer and deeper at night. This is because more melatonin is produced in the dark when the light entering the eye is reduced.[15]

In addition, the serotonin neurotransmitter system also increases the capacity of receptor cells to bind glucocorticoids (adrenaline to a stress hormone) that causes a decrease in the levels of the adrenal hormone (hormone cortisol). This process causes feelings of relaxation in the infant to feel more comfortable and quiet during sleep.[12,16]

At the touch, there is a change of brain waves that is the decrease of alpha waves and the increase of beta waves and theta that can be seen through the use of EEG (Electroencephalography).[17] Changes in brain waves are caused by the arousal activity of parasympathetic nervous system of raphe nuclei. Raphe nuclei is a nucleus derived from the raphe medial of the brainstem and projectes in most regions of the brain, especially those leading to the dorsal root of the spinal cord and to the hypothalamus where one of its functions is secreting the hormone serotonin.

Raphe nuclei is the most striking stimulant area that can cause a natural sleep state. Parasympathetic nerve stimulation of the raphe nuclei will result in decreased metabolism, pulse, blood pressure, respiratory rate and increased serotonin secretion.[14] Raphe nuclei also projected into the hypothalamus, so stimulation of the raphe nuclei will also lead to stimulation of the hypothalamus, and cause secretion of Corticotropin Releasing Factor (CRF). Further, CRF stimulates the pituitary gland to increase proopiomelanocortin (POMC) production so that the production of enkephalin by the adrenal medulla increases. The pituitary gland also produces endorphins as neurotransmitters that can affect the mood to relax. Increased endorphins and enkephalin cause the body to relax, and create a sense of calm so that tension diminishes and allows the baby to fall asleep.[14]

With the feeling of relaxed and calm the baby will be easier to get a sound sleep and quality. The state of calm and relax causes the brain waves to slow down, the slower it ends up making a person able to rest and fall asleep. Changes in brain waves that occur is the decrease of alpha waves and increase theta beta waves, where the brain waves are very influential in the process of sleep, so that the stability of the pulse and temperature can be maintained. Therefore, the gentle human touch is very effective for the premature infants in gaining weight and maintaining temperature and pulse rates.[13,17]

CONCLUSION

There is a significant effect of Gentle Human Touch therapy performed two times a day to increase body weight, temperature and pulse rate stability in preterm babies. It is suggested that this therapy can be a guidance of care in the premature babies in addition to the regular care in the hospital. Further research is needed related to the perinatal stress levels with PIPP (Premature Infant Pain Profile) Assessment Tool, sleep quality, length of stay in the hospital, and stress hormone levels (cortisol saliva).

Declaration of Conflicting Interest

None declared

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Author Contribution

All authors contributed equally in this study.

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