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THE IMPACT OF COMBINATION OF BREASTFEEDING AND EFFLEURAGE MASSAGE IN REDUCING PAIN RESPONSE IN INFANTS INDUCED BY BLOOD SAMPLING IN C-REACTIVE PROTEIN TEST: AN OBSERVATIONAL CROSS-SECTIONAL STUDY

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Abstract
Background: C-reactive protein test is one of clinical assessments to minimize risks of infection in infants. However, its procedure may cause pain. Pain in the infants may result in negative metabolic behavior, physiology and metabolic response.
Objective: This study was to describe the infant's pain response by administering a combination of breastfeeding and an effleurage massage on the blood sampling procedure of C-reactive protein examination.
Methods: This was a descriptive observational cross-sectional study. There were 30 infants selected using consecutive sampling technique, which 15 samples assigned in an intervention group (combination of breastfeeding and effleurage massage) and a control group. Premature Infant Pain Profile (PIPP) instrument was used to measure pain. Univariate analysis was performed with the aim to describe data in mean and median.
Results: The average of pain response at one-minute observation in the combination of breastfeeding and effleurage massage group was 7.47 ± 1.356, and the average of pain response in the control group was 10.80 ± 1.897. The average pain at five-minutes observation in the intervention group was 3.53 ± 1.922 and control group was 6.00 ± 1.852.
Conclusions: Pain responses in the combination of breastfeeding and effleurage massage group were lower than the pain response in the control group.

Keywords: breastfeeding; effleurage massage; baby; pain; blood sampling

INTRODUCTION

Every labor is expected to have a healthy baby, but not all labor is normal. There is sometimes a complication, which is needed to be referred from public health centers to a hospital. Even healthy babies born from the delivery process still need to be more intensively observed to minimize risks to their health (Simbolon, 2008). One of the risks that can occur in infant's health is the occurrence of infection. Even small infections can be a

risk of sepsis in infants due to low immunological system (Afriyanti, 2010). Thus, clinical assessment is needed, which is one of the assessments is by investigating C-reactive protein (CRP) (Afriyanti, 2010).

C-reactive protein procedure is done by taking intravenous blood samples that cause the baby to feel pain early in life. Pain in the infant may result in negative metabolic behavior,

physiology and metabolic response (Anand, 2001). Extreme physiological changes can be a contributing factor to the incidence of hypoxia, hypercarbia, acidosis, asynchronous ventilator, pneumothorax, reperfusion trauma, venous congestion, and intraventricular hemorrhagic. Pain exposure is a stimulus that can damage the baby's brain development and contribute to learning disorders and behavior in childhood (Badr et al., 2010). Therefore, the principle of traumatic care in the management of blood sampling is very important.

One of the principles in traumatic care is to minimize pain, which can be done independently by nurses through non-pharmacological pain management without waiting for instructions from the doctor. In addition, this non-pharmacological management is safe, non-invasive and affordable. Some of the non-pharmacological pain management that can be done, such as giving glucose / sucrose, breastfeeding, non-nutritive sucking (NNS), massage, skin-to-skin contact, and swaddling. Breastfeeding or provision of breast milk as a pain reliever is considered more natural, easy to obtain and use, no additional costs, and no risk (Schollin, 2004). While effleurage massage is a soft and rhythmic massage technique used to decrease the pain response to make babies feel comfortable (Jain, Kumar, & McMillan, 2006). Effleurage is a safe massage technique, easy to do, no requiring many tools, no cost, no side effects and can be done alone or with the help of others (TANJUNG, 2016).

The main action of effleurage massage is the application of the Gate Control theory that can "close the gate" to inhibit the pain stimulation at higher centers in the central nervous system. Previous study proved that baby who is given a massage had a lower PIPP score after blood sampling of the heel than before being massaged with an average pain score of 8.07 (moderate pain) (Abdallah, Badr, & Hawwari, 2013). Another study proved that there were significant outcomes in breastfed infants group with lower pain responses than in the infants given immunization with an average pain score of 4.37 (moderate pain) (Astuti, 2011). However, there is a lack of information on the combination of the two interventions. Therefore, this study aimed at describing pain response of infants during blood sampling in the group given a combination of breastfeeding and effleurage massage and a control group.

METHODS

Study design
This was a descriptive observational cross-sectional study. The research was conducted in the Perinatology Ward of Siti Khodijah Hospital Sepanjang Sidoarjo East Java in February 2017.

Population and Sample
There were 30 infants selected using consecutive sampling technique, which 15 samples assigned in an intervention group (combination of breastfeeding and effleurage massage) and a control group. The inclusion criteria of the sample were infants born with gestational age over 36 weeks, weight >2500 gr, no history of the disease at birth and no congenital defects, stable condition with normal vital signs, getting oral nutrition (breast milk), with an indication of C-reactive protein examination according to the results of a doctor's examination, parents of babies were allowed their children to be respondents.

Instrument
Premature Infant Pain Profile (PIPP) instrument was used to measure pain and has been validated for premature and mature infants during an action that causes pain. The instrument was developed by Stevens, Johnson, Petryshen et al, with internal consistency validity data using Cronbach's alpha = 0.76-0.59. PIPP is used in infants between the ages of zero to three months, both underweight and underweight. The PIPP has 7 indicators that represent a multidimensional pain scale because it assesses physiological, behavioral, and gestational parameters. PIPP values range from 0 to 18, i.e. if less than 6 indicate no pain, values between 7 to 12 show moderate pain, and values over 12-18 indicate severe pain. Conducting a PIPP pain scale assessment is first by determining gestational age, then evaluating the value of 15 seconds

before the blood sampling procedure begins, and noting the baseline data of heart rate and oxygen saturation. Observing the infant for 1 minute and 5 minutes after the blood sampling procedure, and summing up all scores of facial expression changes (eyes closed, forehead wrinkles, nasolabial folds) and physiological parameters (heart rate and oxygen saturation) (Stevens, Johnston, Petryshen, & Taddio, 1996).

Intervention
The intervention group was given a combination of breastfeeding and effleurage massage by a gentle sweep on the area around the blood sampling action (from the wrists / feet to the base of the arm / thigh on the area of the invasive action) within 2 minutes before blood sampling and up to 5 minutes after the procedure. Pain response was observed using PIPP scale started from 15 seconds before action up to 5 minutes after action. In the control group the infant was put in a lying position on the action table at the time of the blood sampling.

Data analysis
Univariate analysis was performed with the aim to describe data in mean and median in the form of frequency distribution table.

Ethical considerations
This study has been approved by the Research Ethics Committee of Poltekkes Kemenkes Semarang with approval number 111 / KEPK / Poltekkes-Smg / EC / 2017.

RESULTS

Based on table 1 it can be seen that the age of respondents in the intervention group was mostly at the age of 37, 39 and 40 weeks respectively as many as 13.33% (4 respondents), while the majority of respondents in the control group had gestational age of 39 weeks (16.67% (5 respondents) respectively. The p-value was 0.743 (> 0.05), which indicated that both intervention and control group were homogeneous.

Table 1 Frequency distribution of respondents based on gestational age (N=30)

Variable	Category	Group				Total N=30		*p value
		Intervention n=15		Control n=15				
		N	%	N	%	N	%	
Gestational age	37 years	4	13.33	4	13.33	8	26.7	0.743
	38 years	3	10	3	10	6	20	
	39 years	4	13.33	5	16.67	9	30	
	40 years	4	13.33	3	10	7	23.3	

Levene's Test

Table 2 Frequency distribution of respondents based on gender (N=30)

Variable	Category	Group				Total N=30		*p-value
		Intervention n=15		Control n=15				
		N	%	N	%	N	%	
Gender	Male	8	26.7	8	26.7	16	53.4	1.000
	Female	7	23.3	7	23.3	14	46.6	

Chi Square Test

Table 2 shows that the respondents in the intervention and control group consisted of males (26.7%) and females (23.3%) with p-value 1.000 (>0.05), which indicated that the gender of respondents in both groups were homogeneous.

Table 3 Pain level in the intervention and control group in one minute and five minutes observation

Group	Variable	N	Mean	Median	SD	Min-Max
Intervention	1 minute	15	7.47	8.00	1.356	4 - 9
	5 minutes		3.53	3.00	1.922	1 - 7
Control	1 minute	15	10.80	11.00	1.897	7 - 14
	5 minutes		6.00	6.00	1.852	3 - 10

Based on Table 3 in the intervention group (combination group of breastfeeding and Effleurage massage), the average response of the respondent's pain measured at 1-minute observation was 7.47, with the standard deviation of 1.356. The lowest pain response was 4 and the highest pain response was 9. The analysis result for the average of the respondent's pain measured on the 5-minutes observation was 3.53 with a standard deviation of 1.922. The lowest pain response was 1 and highest pain response was 7.

In the control group, the average response of the respondent's pain measured at 1-minute observation was 10.80, with the standard deviation of 1.897. The lowest pain response was 7 and the highest pain response was 14. The result of the analysis for the average of respondent pain measured on the 5-minutes observation was 6.00, with a standard deviation of 1.852. The lowest pain response was 3 and highest pain response was 10.

Table 4 Category of pain level in the intervention and control group in one minute and five minutes observation

Pain Level	Category	Intervention N=15		Control N=15	
		N	%	N	%
1-minute observation	No pain	3	20	0	0
	Moderate pain	12	80	13	86.7
	Severe pain	0	0	2	13.3
5-minutes observation	No pain	14	93.3	9	60
	Moderate pain	1	6.7	6	40
	Severe pain	0	0	0	0

Table 4 shows that the pain level at 1-minute observation was mostly in the moderate pain category both in the intervention group (80%) and control group (86.7%), while at 5-minutes observation there was a significant reduction of pain in both groups, which the intervention group showed no pain (93.3%) and moderate pain (6.7%), and the control group with no pain (60%) and moderate pain (40%).

DISCUSSION

Gestational age is a variable that affects infant in response to pain. On the measurement of pain level values based on the PIPP scale (Premature Infant Pain Profile), gestational age is given a separate score with a maximum value of 3 that distinguishes the total score in premature and mature infants with maximal value in premature babies of 21 and mature infant of 18.

At 20 weeks, gestational age, receptor and cortical neurons have developed; at gestational age of 24 weeks, cortical synapses arise; and at 30 weeks of gestation, myelinization occurred on pain line and the development of the spinal cord synapse with sensory fibers (Lissauer, Fanaroff, Miall, & Fanaroff,

2015). In this study all respondents had gestational age in the range of 37-40 weeks, which myelinization on the pain line and sensory fibers have grown.

The results of this study revealed that the intervention group given a combination of breastfeeding and effleurage massage on 1-minute observation was in the category of moderate pain level and no pain, while the control group was in the category of moderate pain and severe pain. Each group experienced moderate pain at the most. This suggests that within 1 minute there has been a decrease in the pain response in which the intervention response group has a higher reduction in pain than the control group.

While in 5-minute observation it is showed that the intervention group and control group were mostly in the category of no pain, and the severe pain category in both groups was no longer found. However, the control group still had moderate pain. This indicates that within 5 minutes the pain response has been largely returned to the condition prior to the stimulation of pain.

It is indicated that breastfeeding and effleurage massage group is better to reduce pain (7.47) lower than pain in the control group (10.80) for 1-minute observation and also for 5–minutes observation which the intervention group showed a better result in reducing pain (3.53) than the control group (6.00).

Breastfeeding can reduce the pain response in infants because breast milk can make sensory perception stimuli with the sweetness of lactose. This stimulus will be sent to the cerebral cortex, which will then be forwarded to the hypothalamus. The hypothalamus will secrete corticotrophin-releasing factor (CRF) in which the CRF will activate the pituitary to secrete endogenous opiates i.e. β-endorphin and encephalin. Both opiate peptides serve as a potent painkiller so that the pain response will be reduced. Research found that breast milk is quite effective in reducing the pain response during minor invasive procedures in the mature infant (Carbajal et al., 2008).

According to Potter, breastfeeding affects the sympathetic nervous system that stimulates the adrenal medulla so catecholamine decreases. The decreased catecholamine causes dilated blood vessels to decrease the pulse and blood pressure (Perry & Potter, 2005). Many benefits are found during breastfeeding, in addition to the sweet taste that can induce endogenous opioids to have a positive effect on the pain response.

Breast milk also contains a high concentration of tryptophan, which is a melatonin precursor. Melatonin hormone is produced by the perineal gland of the brain that has the function of helping regulate other hormones, maintaining the rhythm of the circadian body and being antioxidants. Melatonin has been shown to increase beta-endorphin concentration and allows it to be a mechanism of nociceptive effect of breastfeeding (Hegar, Suradi, Hendarto, & Partiwi, 2008).

Another method of pain reduction is the effleurage massage in which the action may modulate pain impulses in the gelatinous substance in order to provide inhibition to the transmission of pain impulses. The effects of effleurage massage cause a relaxing effect.

Gate Control Theory explains that in every dorsal horn of the spinal cord there is a gate-like mechanism that inhibits or facilitates the spinal cord signaling before it causes perception and response to pain. Large diameter nerve fibers tend to close the door so that pain signals cannot enter through the spinal cord whereas small diameter nerve fibers tend to open the door so that pain signals can enter through the spinal cord to the brain. This theory shows that pain signals can be affected by stimulating the location of peripheral pain such as by bringing a touch signal (mechanoreceptor) and by stimulating opioid mediated exposure so that the door closes and ultimately reduces the pain (Nathan, 1976).

The results of this study were also supported by Philips research of 96 neonates who did blood sampling found that the percentage of duration of crying in the group of infants who were given breast milk is lower than the group of infants who were pacifier, which was 33% compared to 66% (Phillips, Chantry, & Gallagher, 2005). While the result of this study was in contrast with the research conducted by Jain on 23 infants (birth weight 795-2507 g), which showed no adverse physiological effects of massage on respiration rate, oxygen saturation and cortisol in blood sampling (Jain et al., 2006).

However, this study combines the two interventions with stronger results. It is because breast milk has the stimulating effect of opioids that stimulates the baby's comfort while massage provides a relaxing effect and activates the stimulated gate control system at the same time, which make it more effective in reducing the pain response in infants.

LIMITATIONS

Respondents who were given a blood-sampling stimulus might have been exposed to other types of pain stimulus such as injection of vitamin K injection that must be given to newborns. The experience of previous pain exposure might also affect the patient's pain response, which considered as the limitation of the study

CONCLUSION

Based on the research result, it was concluded that the mean score of PIPP infant pain response in the intervention group given a combination of breastfeeding and effleurage massage group was lower than control group either at 1 minute or 5-minute observation. The researchers further suggest comparing both groups to find out how much effectiveness of breastfeeding and massage effleurage in reducing infant pain so it can be used as an alternative in reducing pain due to invasive actions in infants.

Author Contribution
All authors contributed equally in this study.

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