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SUCROSE AND SWADDLING EFFECTIVELY REDUCE PAIN RESPONSE ON NEONATAL BLOOD SPOT BY HEEL PRICK

Mega Hasanul Huda*, Rustina Yeni, Agustini Nur

¹Bunda Medical Health Services

²Departement Pediatric Nursing, Faculty of Nursing, University of Indonesia

³Departement Pediatric Nursing, Faculty of Nursing, University of Indonesia

*Corresponding author's e-mail: megahasanulhuda@gmail.com

ABSTRACT

Background: Pain stimulates distress emergence that potentially impairs the development and growth on neonates. Heel prick brings about pain. This research aimed at observing the effectiveness of sucrose and swaddling on pain response to neonates.

Methods: A clinical trial was designed by random under control using cross-over design. This study involved 24 neonates (aged 28 days) which taken from population using a consecutive sampling technique. Each subject was given two treatments of sucrose (24%) and swaddling, but the pain responses were observed at different time during and after received the heel prick (1, 2, and 3 minutes). Response of neonatal pain focused on face observation, oxygen saturation, and heart rate, but scored by the experts using a set of observation sheets from Cries Neonatal Postoperative Pain Measurement Tool (CNPPMT).

Results: During the heel prick, the average of pain response was found higher on sucrose group (2.67). After a minute elapsed, the average of pain response on both groups was similar (1.96). After two and three minutes elapsed, the average of pain response was found higher on swaddling group. Bivariate results showed that there was no different average of the pain response on both groups during the heel prick ($p=0.925$) and after the heel prick (one minute ($p=0.915$), two minutes ($p=0.942$), and three minutes ($p=0.132$)).

Conclusions: Research revealed that sucrose and swaddling equally effective in reducing pain response on neonatal blood spot by heel prick. Swaddling could be carried out to reduce pain response on infants when pricking applied.

Keywords: neonates, swaddling, heel prick, pain response, sucrose.

INTRODUCTION

Hospitalization involved a process in hospital care which often led to a crisis for a child at all stages[1]. Various problems were found in early life of neonates that he/she should receive treatment in hospital. Invasive procedure was often performed during the treatment process that potentially caused pain in neonates. Nearly 80% of procedure which caused pain did not get treatment to prevent the onset of pain[2].

54 neonates who received treatment experienced 3283 times actions that could cause pain, and 55% of actions were taken by the heel prick[3]. The heel prick was more often done because this was an invasive procedure that was recommended to be done on the baby by pricking at 1/3 area of foot[4].



Pain received by the neonatal during heel prick had the potential to cause harmful effects in neonates. The impact of harmful effects triggered distress that potentially impaired brain development in neonates. In addressing the impact of the pain, the nurse had to apply the principles of a traumatic care which was defined as the provision of care by minimizing the child's emotional and physical threat[5].

Previous studies explain that sucrose is an intervention that can be done by nurses to reduce the pain response in newborns. Giving Oral sucrose has been one of interventions that a nurse usually does to reduce the pain response of neonates during invasive procedures[6]. Nonpharmacologic intervention using sucrose effective for stress management from pain in medical procedures[7]. Sucrose can decrease crying time which is an indicator of pain in children who get invasive procedure[8]. However, the intervention cannot be given to neonates with exclusive breastfeeding.

Swaddling affects the response of neonates during heel prick[9]. Another study explains that Swaddling able to reduce the response of premature infant pain during heel puncture[10]. Some studies conducted in some of these countries explain that swaddling affects the pain response during heel prick, so that swaddling as another option of such intervention has been performed by a nurse in reducing neonatal pain response.

The effectiveness of the administration of sucrose and swaddling against neonatal pain response in the act of taking blood through the heel will need to examine whether there are any differences in the effects of both interventions. Until present time, there have been no published that compare the effectiveness of swaddling and oral sucrose in reducing neonates pain response on neonatal blood spot by heel prick.

METHODS

This study was designed to use an approach in the randomized controlled clinical trials using cross-over design. Each subject was given two treatments of sucrose and swaddling. The order of the two treatments given to each subject in this study was based on the results of randomized in blocks (block randomization) in a random table. This study was conduct between March-Mei 2015 in Perinatology Room RSUD Tarakan Jakarta.

The sample in this study was 24 neonates. Samples were taken by using consecutive sampling technique. Inclusion criteria for the study sample were: babies born at term, the newborn until the age of 28 days, not exclusively breastfed, good suction reflex, performed blood sampling; whereas the exclusion criteria, namely: neonates with congenital abnormalities in the mouth and extremities based medical diagnostics, neurological disorders based on medical diagnosis, and got analgesic.

Procedure for giving sucrose intervention was performed 2 minutes before pricking the heel using drop pipette. Sucrose 24% was given to neonates 2 minutes before heel prick procedure because the relaxing time that was given by sucrose happened in two minutes after dropping[8].

Swaddling procedure was performed 10 minutes before pricking the heel. Cotton with length 120 cm and width 100 cm was used to cover the body of neonates. The research assistant folded the top side of the bedding cotton by adjusting to the height of the neonates. Furthermore, the neonates was positioned on the cotton. Swaddling done by closing the head area, folding the right side to the left side, folding the left side to the right side, and tucked the remaining cotton. Heel area was not covered by cotton.

This study used observation sheets from Cries Neonatal Postoperative Pain Measurement Tool (CNPPMT) [11]. This research was issued ethical clearance from ethics research commission Faculty of Nursing University of Indonesia. This research was conducted by applying research ethics that is Beneficence (researchers are required to maximize the benefits of research), Respect for Human Dignity (parent has the right to decide to join in the study without coercion and threats), and justice (be fair to all respondents).

Data were collected by recording the response of neonatal pain that focused on face observation, oxygen saturation, and heart rate when the heel prick was taken until three minutes later. Recordings obtained were seen by experts who had the experience in researching pain to do an assessment of neonatal pain

response. Furthermore, the data were processed under the Eta Test to see the relationship between the characteristics of respondents (sex) against neonatal pain response and Wilcoxon test to see the difference in average response time of the stabbing heel pain neonates and after pricking the heel was taken (the first minute, second minute, and third minute) from the group of sucrose and swaddling.

RESULTS

The number of neonatal male sex equal to the female neonates was 12 neonates (50%). From Bivariate test, the result was obtained by value $p = 0.398$ ($p > 0.05$); so it could be concluded that there was no relation to sex neonatal pain response in blood spot through the heel.

The mean of neonatal pain response during the heel pricking was found higher in the sucrose group (2.67). One minute after the heel prick, the mean of pain responses was similar in both groups. Two minutes after the pricking, pain responses were higher in the group of swaddling (1.71); while, in the third minute after the pricking, the higher rates of pain responses were at swaddling group (0.5).

Table 1. Comparison of the Sucrose Group and Swaddling Group Mean Score of Pain Response During Heel Prick until # Minutes After Heel Prick (n=24)

| Pain Response | Mean | SD | SE | 95% CI | p value |
|---------------------------|------|-------|-------|-----------|---------|
| During Heel Prick | | | | | |
| Sucrose Group | 2.67 | 2.239 | 0.457 | 1.72-3.61 | 0.925 |
| Swaddling Group | 1.96 | 1.334 | 0.272 | 1.39-2.52 | |
| 1 Minute After Heel Prick | | | | | |
| Sucrose Group | 1.96 | 1.334 | 0.272 | 1.39-2.52 | 0.915 |
| Swaddling Group | 1.96 | 1.574 | 0.321 | 1.29-2.62 | |
| 2 Minute After Heel Prick | | | | | |
| Sucrose Group | 1.67 | 1.167 | 0.238 | 1.17-2.16 | 0.942 |
| Swaddling Group | 1.71 | 1.16 | 0.237 | 1.22-2.2 | |
| 3 Minute After Heel Prick | | | | | |
| Sucrose Group | 0.29 | 0.624 | 0.127 | 0.03-0.56 | 0.132 |
| Swaddling Group | 0.5 | 0.885 | 0.181 | 0.13-0.87 | |

Table 1 Pain Response Difference on Sucrose and Swaddling Group at the moment of heel prick taken in Tarakan Local Hospital March-May 2015 (n=24).

DISCUSSION

Application of the principle a traumatic care was a key task for a child nurse and an integral part of nursing[12]. One way to do was with non-pharmacological interventions to minimize the pain received by the neonatal during the heel prick. Administration of sucrose aimed to reduce the pain response that was received by the newborn, so that sucrose acted as analgesics to reduce pain during heel prick. The results showed that the higher rates of neonatal pain response were found in the group that received sucrose when the heel prick was taken, and the response gradually fell until the third minute after the heel prick. The results showed that the pain response after the heel prick declined every minute on neonates given sucrose.

Sucrose had two effects, namely a strong sense of sugars that could cause rapid response and short in calming the baby by stimulating the production of endorphins through opioid reception on the tongue[7]. This effect had a peak point at 2 minutes after administration and the effect could last up to 5 minutes. In addition, sucrose might also decrease pain through endogenous opioid mechanism that served as a natural analgesic. Sucrose could also increase the pain threshold and work on the central nervous system. Sucrose administration increased the pain threshold in mice when compared with mice which received placebo (water) or did not receive any intervention. Increasing pain threshold showed that glucose could



be used reversibly[13]. Glucose did not produce an analgesic but blocked the part of the agonist use to produce analgesia.

Sucrose was a non-pharmacological intervention used in pain management that aimed to minimize the intensity, duration, and the physiological effects of pain arising from heel pricking procedures in neonates. Sucrose that could reduce crying time as an indicator of pain in children who received invasive procedures[6]. Sucrose was the best intervention to reduce pain in neonatal heel prick[14]. These interventions can be carried out independently by nurses in applying the principles of a traumatic care that reduce pain felt by children who get invasive procedures. In addition, sucrose does not have side effects, so the use over and over can be done to reduce the pain response of neonates who received the heel prick.

Swaddling is a technique used to reduce the movement of the baby. Decreased pain that occurred when the baby swaddled was caused by the minimized movement as the body of the newborn infant was wrapped around by swaddling cloth. The swaddling could improve comfort for neonates[9]. Therefore, swaddling was recommended for use as a non-pharmacological intervention that could prevent the onset of pain in neonates during the heel prick, as a form of application of the principle a traumatic care performed by nurses. Swaddling was another alternative that could be used as a non-pharmacological intervention in overcoming pain in the neonatal blood spot through the heel. This was indicated by the results of research that the mean of neonatal pain response at Swaddling group decreased in the second and third minutes after the pricking.

The mean of neonatal pain response in the sucrose group and the swaddling group was different between at the moment of the pricking and after the pricking. When the heel pricking was done, the average pain response was higher in the sucrose group (2.67). However, after the pricking, pain response gradually fell in both groups. In the first minute, and second, the mean pain responses were similar in both groups (1.96); while in the third minute of pain response was higher in the swaddling group.

Administration of sucrose and practice of swaddling applied the Theory Comfort Kolcaba where nurses could meet the needs of neonatal physical comfort. Physical comfort brought about by the interventions in this study could be observed from the response to the pain felt by newborns that decreased every minute.

In providing nursing care for children, especially neonates, a traumatic care nurses apply the principles, one of which is to minimize the pain felt by newborns when invasive procedure performed. Various ways can be done by nurses in pain management in neonates. This study revealed that administration of sucrose and practice of swaddling in neonates who received heel pricking actions had no difference, so it could be concluded that swaddling had the same ability with sucrose against neonatal pain response.

Swaddling is a self-practice by nurse who has been well-established in our country. When compared with sucrose, swaddling has many advantages. From the economic side, swaddling is relatively cheaper because swaddling is not consumable goods such as sucrose. Swaddling can be used repeatedly after washing or cleaning. This will certainly reduce costs because of the swaddling has a period of relatively longer usage when compared with sucrose. In terms of availability, swaddling is relatively easy to find because swaddling can be easily obtained without the need to be booked in advance.

The main advantage of swaddling is that it could be done in neonates who were exclusively breastfed. Swaddling action is an effective way in reducing neonatal pain response without giving anything to the mouth of the neonates as sucrose that has the potential cause for a neonate interrupted in obtaining exclusive breast milk. The implementation of swaddling intervention can be used to reduce neonatal pain response and to enhance program of exclusive breastfeeding for infants.



CONCLUSION

The mean of neonatal pain response during heel prick was higher in the sucrose group. In the first minute, and second, the mean of pain responses was similar in both groups; while in the third minute of pain response was higher in the swaddling group. Administration of sucrose and practice of swaddling had no difference in the response of neonatal pain; therefore it could be interpreted that both non-pharmacological interventions that had the same ability in reducing neonatal pain response in the blood sample through the heel.

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