Comparing the effect of swaddling and breastfeeding and their combined effect on the pain induced by BCG vaccination in infants referring to Motahari Hospital, Jahrom, 2010–2011

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A B S T R A C T

Background and aim: Despite the clinical importance of pain, many neonates are subjected to numerous painful invasive procedures and their complications as part of their care. This study has been designed to investigate the effect of swaddling and breastfeeding, and their combined effect on the pain induced by BCG vaccination in healthy term infants.

Method: This randomized double-blind intervention study was performed on 131 healthy term neonates in Motahari Hospital of Jahrom. The samples were randomly assigned into three intervention groups and a control group. The infants in the swaddled group were swaddled 2 minutes before and 2 minutes after vaccination. The infants in the breastfed group were breastfed within 45 minutes before vaccination. The infants in the combination group were both breast fed before and swaddled within vaccination but the infants in the control group were vaccinated without any intervention. Heart rate and oxygen saturation level of neonates were recorded in the 3 phases of: baseline, injection and 2 minutes after injection. Furthermore, the neonates’ faces were recorded using a video camera. Then pain intensity was measured by Neonatal Facial Coding System (NFCS). Mean Score of pain intensity and physiological responses of subjects were statistically analyzed using non parametrical Kruskal–Wallis test and Mann–Whitney.

Results: The mean of pain intensity (NFCS) and changes in the heart rate at injection time to the baseline in the three intervention groups in comparison with the control group showed statistically significant difference (p = 0.003 and p = 0.002 respectively). However changes in blood oxygen saturation level, were not statistically significant difference between four groups.

Conclusion: Regarding to the significant impact of both breastfeeding and swaddling on the pain reduction of vaccination, it is recommended to take benefit of these two safe and available non-pharmacological methods in order to relief pain during painful procedures.

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1. Introduction

The concept of pain in infants is a new focus in the health care. Researches have shown that infant pain is often unknown and remains extensively untreated. Until the 1980s, analgesics were rarely used even in pain related actions such as neonatal surgery. In 1995, this wrong belief became commonplace that infants lack nociceptive transmission mechanisms because of infant neurons incomplete myelination and the child’s inability to remember pain and also the fear of infants’ dependence to medications (Wong, 2011). In recent years based on new studies this concept has changed. Lack of myelination in neonatal nerves is completely offset by the shorter neuromuscular distances traveled by the impulses. Researches show that nociceptive nerve tracts in the spinal cord and CNS undergo complete myelination during the second and third trimesters of gestation (MacDonald, SM, & Mullet, 2005). Furthermore, connecting cortical of thalamus required for pain perception are present by 24 weeks of gestation and are fully organized in infancy; therefore infants (even premature) not only have neurotransmitters and neural pathway similar to adults, but also because of the premature development of descending pain-modulating systems are more sensitive to pain than adults (Simsons & T D, 2006).

Acute pain is more common in neonates than chronic pain. For example, each full-term healthy infant experiences at least 3–5 painful procedures after birth in neonates unit and each neonate approximately undergoes 16 stress or pain-related procedures in intensive care unit per day (Carbajal et al., 2008). It also has been said that most objective pain behaviors in children of all ages is caused by injection; although vaccination is the most effective method of disease prevention, it is the most common cause of pain-producing iatrogenic in sucklings and requires more attention (Ghasemi & Valizade, 2007; Nickruz, R S, Eijani,...
Studies also show that a large number of vaccines and vaccine related pain in infants is the cause of concern in parents (Chen, Chang, Hsiao, Chen, & Lin, 2005). In addition, untreated pain in newborn is directly related to their mortality: because pain can lead to loss of appetite, poor food intake, delayed wound healing, and difficulty in mobility, sleep disturbance, irritability and regression of the infant’s development (Goliang, Krane, Seybold, Almgren, & Anand, 2007).

Based on physiological, human and health reasons, prevention and management of pain are better than its treatment (Anand, Stevens, & McGrath, 2007). However pain assessment in infants is notoriously difficult and controversial, yet today pain is considered as the fifth vital sign (Cignacco et al., 2007). Good management requires correct pain assessment and its treatment by pharmacological and nonpharmacological interventions (Pillai Riddell et al., 2011). However, a more recent study conducted by Pyrmula found that use of acetaminophen before vaccination significantly reduces antibody levels to several of the vaccine antigens (Harrington et al., 2012). Short-term efficacy and tolerability of nonpharmacological interventions have led to their extensive use to manage pain-related procedures in neonates. For neonates, there was sufficient evidence to recommend sucking-related interventions as an effective treatment for pain reactivity and immediate pain-related regulation. Holding/rocking was also found to be efficacious for neonatal immediate pain-related regulation (Pillai Riddell et al., 2011). It has been established that breast milk can act as an endogenous morphine (Bueno et al., 2012), and breast sucking by the infant can create a calming effect too. So researchers believe that breast feeding can reduce the pain perception in infants (Bueno et al., 2013; Sabic, Blattner, & Metts, 2015).

In addition to breast milk, researchers show that containment or swaddling (nesting) prevents increasing the behavioral distress and brings the sense of safety to infants (Van Sluwen et al., 2007).

Unfortunately, despite the clinical significance of pain in neonates, invasive procedures expose infants to numerous and repetitive pains. Therefore implementing approaches to reduce the perception of pain in neonates is essential. However, there has been very little research to determine a natural, cost-effective intervention to pain perception in the infant population (Tansley & Lindberg, 2010). Since the two interventions of swaddling and breastfeeding are safe, inexpensive, easy to use and also no study has been conducted on the effectiveness of the two interventions on the pain induced by BCG vaccination in neonates, the researchers have conducted this trial.

2. Materials and methods

2.1. Setting

This randomized double-blind intervention study took place in vaccination unit of Motahari Teaching Hospital affiliated to Jahrom University of Medical Sciences in Iran. This unit is at Obstetrics and Gynecology ward of this hospital.

2.2. Sample

This study was performed on 140 full-term healthy infants who were born during the study in Motahari Hospital in 2010–2011. Inclusion criteria were as follows: full-term (37–42 weeks), postnatal age less than 3 days, no evidence of obvious abnormality or illness by the physician exam, Apgar score 7–10 in 5th minute after birth, no history of transfusions or invasive procedures except vitamin K injection and at least one vaccination sign (Cignacco et al., 2007). Good management requires correct pain assessment and its treatment by pharmacological and nonpharmacological interventions (Pillai Riddell et al., 2011). However, a more recent study conducted by Pyrmula found that use of acetaminophen before vaccination significantly reduces antibody levels to several of the vaccine antigens (Harrington et al., 2012). Short-term efficacy and tolerability of nonpharmacological interventions have led to their extensive use to manage pain-related procedures in neonates. For neonates, there was sufficient evidence to recommend sucking-related interventions as an effective treatment for pain reactivity and immediate pain-related regulation. Holding/rocking was also found to be efficacious for neonatal immediate pain-related regulation (Pillai Riddell et al., 2011). It has been established that breast milk can act as an endogenous morphine (Bueno et al., 2012), and breast sucking by the infant can create a calming effect too. So researchers believe that breast feeding can reduce the pain perception in infants (Bueno et al., 2013; Sabic, Blattner, & Metts, 2015).

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2.3. Procedure

Mean of pain score by NFCS in pilot study (10 subjects in each group) were .54, 5.40, 5.90, 4.66, SD was 1.75, <i>α</i> = 0.05, power = 80%. Using Statistical software NCSS-PASS 2001, the sample size was calculated 116 subjects (29 subjects in each group). Finally, regarding to attrition, sample size was considered 140 neonates. Then after obtaining parental informed consent, the interventions were done in the three intervention groups. The interventions were as follow:

Neonates of breastfeed group were breast-fed within 45 minutes prior to vaccination and were not swaddled (<i>n</i> = 33). The swaddled group, were swaddled a few minutes before vaccination and a few minutes later, while more than 45 minutes had passed from being breastfed (<i>n</i> = 34). The infants in the combined group, were swaddled a few minutes before vaccination and a few minutes later, and breast-fed within 45 minutes prior to vaccination (<i>n</i> = 31). The infants in the control group were vaccinated according to the hospital routine without any intervention (<i>n</i> = 33). Randomization was done based on the sealed envelope. Demographic data were gathered from mothers’ and neonates’ medical documents. In all subjects, blood oxygen saturation and heart rate were measured by a pulse oximeter that its probe was attached to the infant’s left leg 2 minutes before the vaccination. These parameters were recorded by a research assistant who did not know the type of group (blind) in 3 times; immediately before, during injection and 2 minutes after that. Fixed vaccinator injected 0.5 mg of BCG vaccine (manufactured by Pasteur Institute of Iran), using an insulin syringe (1 ml, 29Gx1/2”) by 10” angle to the skin of deltoid muscle. Meanwhile, a fixed trained research assistant recorded the neonate’s face in a close-up view, by a digital video camera (Panasonic NV-VZ75) in a way that the type of intervention be unknown.

After interventions, the videotapes were reviewed and scored by another fixed research assistant (blind) who has been trained on how to score baby’s face changes, according to NFCS. The research assistant reviewed the face changes in the intervals of the first 15 seconds of vaccination and 2 minutes after the vaccination. In order to calculate the reliability of the data recorded in the NFCS checklist, another scorer randomly reviewed about 30.5% of the films and coded the changes based on the NFCS. The intra-rater reliability was <i>r</i> = .79. The trial was approved by the research ethics committees of Shiraz University of Medical Sciences.

2.4. Instruments

In this study the pain assessment tool was the Neonatal Facial Coding System (NFCS). This behavioral scale codes nine facial actions to monitor pain in neonate (occurred = 1, did not occurred = 0). Eventually, total score zero is defined as the absence of pain and the score of nine (in term neonate) is defined as the maximum intensity of pain. Facial action includes brow bulge, eyes squeeze, deepening of the nasolabial furrow, open mouth, vertical mouth stretch, horizontal mouth stretch, taut tongue, chin quiver, and lip pursing (Chen et al., 2005; Grunau & Craig, 1987). Cross-cultural and conceptual equivalence of the instrument was established by: 1. forward translate to Persian, 2. opinions of expert panel contain of neonatal nurses, clinicians and pediatricians. 3. back-translation of two bilingual translators, 4. finally, pre-testing and cognitive interviewing. Inter-observer reliability was tested through Cronbach’s alpha (<i>α</i> = 0.726).

In addition to NFCS, for measuring the pain intensity, heart rate variability and oxygenation as measured by a standard portable pulse oximeter (mdl BCI 0813 Smiths medical Co.) were considered.

2.5. Data analysis

Collected data were analyzed using the Statistical Package for the Social Sciences (SPSS 21). Appropriately statistical one-way ANOVA test, chi-square, Kruskal–Wallis and non-parametric Mann–Whitney test were used. <i>p</i> < 0.05 was considered significant.
2.6. Findings

From the 140 studied samples, 2 neonates due to the parents unwillingness to cooperate in the study \((n = 2)\), 2 neonates because of soothing intervention \((n = 2)\), 3 neonates because of crying onset before injection \((n = 3)\), and another 2 neonates due to loss of videotape were excluded from the study. Therefore, statistical analysis was performed on 131 subjects.

Results showed that 44.28 percent of the total subjects were female \((n = 58)\) and 48.85 percent of the subjects were born by normal vaginal delivery. Mean mothers’ age in 131 eligible subjects was 26.97 ± 4.79 years. Mean gestational age of neonates was 38.66 ± 1.06 weeks. Mean postnatal age upon entry to the study was 1.70 ± 0.8 days. Mean Apgar score in 5th minute after birth was 9.51 ± 0.79, and mean birth weight was 3142 ± 293.59 g (see Table 1 for demographics and Test scores). The findings of the study have shown that the subjects were homogeneous in terms of gender, mean mothers’ age, gestational age, type of birth, Apgar in 5th minute after birth, postnatal age and birth weight. So there were no statistically significant differences in subjects. Only the two groups of breast fed and combined were different in terms of the time of being breast fed before the procedure in comparison with other groups \((p < 0.001)\), and this difference was related to the type of intervention (Table 1).

The minimum pain intensity in the first 15 seconds of injection belonged to the breast fed group, then combined group, and the swaddled group \((57.48, 57.76, 61.65)\) respectively, with a median number of 4. The control group had the maximum average of pain intensity in the first 15 seconds of injection \((86.74)\) with a median number of 6 (Table 2). Kruskal–Wallis test showed that the four groups in the first 15 seconds of BCG vaccination had statistically significant differences \((p = 0.003)\). However there was no statistically significant difference in the pain intensity 2 minutes after injection between groups. The groups were further analyzed for pain intensity using Mann–Whitney test for the first 15 seconds of injection. The results demonstrated that the mean level of pain in the breast fed and swaddled groups compared to the control group was significantly different \((p = 0.010, p = 0.001)\). Also the neonates in the combined group were different from the neonates in the control group in terms of pain intensity in the first 15 seconds of injection \((p = 0.002)\). This means that the performed interventions in this study could reduce the pain in the neonates (Table 2).

Minimal change in heart rate at the moment of injection to the baseline was observed in the combined group with a median of 1 and mean rank of 50.45. Median and mean rank of these changes in breast feed and swaddled groups were 4 \((63.02)\) and 3.5 \((63.72)\) respectively, while the control group showed the maximum heart rate changes in infants with a median and mean rank of 12 \((85.94)\). Based on the results of the Kruskal–Wallis test, was significantly different \((p = 0.002)\). So the groups were compared in dyads using Mann–Whitney test. The findings indicated that the mean difference of heart rate changes in the control group was statistically significant as compared with the breast feed group \((p = 0.013)\), the swaddled group \((p = 0.016)\) and combined group \((p < 0.001)\). However changes in heart rate at the injection moment were not statistically significant between 3 intervention groups.

Median and mean rank of heart rate difference at 2 minutes after injection as compared with the baseline in the breastfeeding, swaddling, combined and control were \(-1(67.62), -1(66.43), 1(64.11)\) and \(-1(65.71)\) respectively. Kruskal–Wallis test showed no significant difference in changes in heart rate 2 minutes after injection of BCG vaccine in comparison with the baseline in the four groups.

Median and mean rank of changes in blood oxygen saturation at the moment of injection and at 2 minutes after injection as compared with the baseline rate in infants have shown in Table 2. Kruskal–Wallis test showed no statistically significant differences in changes in blood oxygen saturation levels among four groups.

3. Discussion

In this part the results of the study have been explained based on the research hypotheses:

**Hypothesis1.** Mean rank of pain intensity in the intervention groups has a statistically significant difference as compared with the control group.

The results of this study support the hypothesis that mean pain score of the first 15 seconds of injection in the 3 intervention groups was less than the mean score in the control group. This means that probably breastfeeding before and swaddling during the painful procedure of vaccination or combination of both, reduce pain in neonates as compared with control. However; combining the two interventions of breastfeeding and swaddling comparing with each intervention individually had similar effects on pain of vaccination in neonates \((p > 0.05)\) (Table 2). The results of the study of Weissman, Aranovitch, Blazer, and Zimmer (2009) that assessed the pain intensity of heel vaccination reported the results of our study. They concluded that the control group had the highest pain score \((7.10 \pm 1.15)\) and lowest pain score was dedicated to the breastfeeding group \((2.90 \pm 2.40)\) (Weissman et al., 2009). Goswami et al. in India (2013) concluded that direct breastfeeding and 25% glucose act as analgesics in young infants undergoing DPT vaccination (Goswami et al., 2013), this is consistent with the results of the present study. However, as can be seen in Table 2, the mean pain intensity scores of 2 minutes after injection in the control group was higher than other groups, the difference was not statistically significant which is probably related to Insulin needles pain which is sharp and short term. Overall, given the findings of this study it can be concluded that non-pharmacologic interventions of breast-feeding, swaddling or combination of the two shortly before the procedure can reduce the pain of vaccination in healthy term infants. Probably, the analgesic properties of breast milk is related to fat, protein and other components of breast milk which stimulate opioids.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Breastfeeding</th>
<th>Swaddling</th>
<th>Combined</th>
<th>Control</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean maternal age (years)</td>
<td>26.33</td>
<td>27.35</td>
<td>26.51</td>
<td>27.72</td>
<td>.627</td>
</tr>
<tr>
<td>Mean ± 4.29</td>
<td>± 5.54</td>
<td>± 2.89</td>
<td>± 6.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The mean gestational age at birth (weeks)</td>
<td>38.57</td>
<td>38.76</td>
<td>38.83</td>
<td>38.51</td>
<td>.581</td>
</tr>
<tr>
<td>Mean ± 1.17</td>
<td>± 1.01</td>
<td>± 1.01</td>
<td>± 1.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The mean age of the infant after birth (days)</td>
<td>1.66</td>
<td>1.73</td>
<td>1.70</td>
<td>1.72</td>
<td>.973</td>
</tr>
<tr>
<td>Mean ± .84</td>
<td>± .618</td>
<td>± .632</td>
<td>± .632</td>
<td>± .632</td>
<td>.62</td>
</tr>
<tr>
<td>Number of female infants (%)</td>
<td>52.76</td>
<td>54.12</td>
<td>53.87</td>
<td>53.94</td>
<td>.361</td>
</tr>
<tr>
<td>Mean ± 1.73</td>
<td>± 2.99</td>
<td>± 3.05</td>
<td>± 3.99</td>
<td>± 3.99</td>
<td>.177</td>
</tr>
<tr>
<td>Mean birth weight (g)</td>
<td>3045.45</td>
<td>3236</td>
<td>3179</td>
<td>3107.57</td>
<td>.777</td>
</tr>
<tr>
<td>Mean ± 403.76</td>
<td>± 367.2</td>
<td>± 305.9</td>
<td>± 399.82</td>
<td>.943</td>
<td></td>
</tr>
<tr>
<td>Number of babies born by vaginal delivery (%)</td>
<td>39.4</td>
<td>35.88</td>
<td>364.5</td>
<td>330.3</td>
<td>.943</td>
</tr>
<tr>
<td>Mean ± 9.54</td>
<td>± 9.29</td>
<td>± 9.86</td>
<td>± 9.86</td>
<td>± 9.86</td>
<td>.143</td>
</tr>
<tr>
<td>Mean Appgar at 5 minutes of birth</td>
<td>9.54</td>
<td>9.35</td>
<td>9.29</td>
<td>9.86</td>
<td></td>
</tr>
<tr>
<td>Mean ± .79</td>
<td>± .77</td>
<td>± .76</td>
<td>± .76</td>
<td>± .76</td>
<td>.64</td>
</tr>
<tr>
<td>Median of breastfeeding time before the procedure (minute)</td>
<td>15</td>
<td>95</td>
<td>15</td>
<td>60</td>
<td>.001</td>
</tr>
</tbody>
</table>
and block the nociceptive transduction or transmission in the posterior spinal cord and prevents the transmission of pain to the upper centers (Ghasemi & Valizade, 2007). In addition the analgesic effect can be related to sucking and effective procedure of skin-to-skin contact (Asadi Noghahi, Kashaninia, Sajedi, Rahgozar, & Yousefi, 2011).

Hypothesis 2. The mean level of heart rate changes in the intervention groups in comparison with the control group has a statistically significant difference.

To compare these changes, we have divided it into two parts:

A. Changes in heart rate at the moment of injection as compared with the baseline.
B. Changes in heart rate 2 min after injection as compared with the baseline.

3.1. A—changes in heart rate at the moment of injection as compared with the baseline

The results of the present study have shown that the interventions reduce the changes in heart rate at the moment of injection to the baseline as compared with the control group. The three interventions (breastfeeding, swaddling and combination of both) also had similar impact on reducing the heart rate changes in subjects.

In the study of Weissman like the present study, the most changes in the intervention group as compared with the control group had statistically significant difference. In addition the analgesic effect can be related to sucking and effective procedure of skin-to-skin contact (Asadi Noghahi, Kashaninia, Sajedi, Rahgozar, & Yousefi, 2011).

Hypothesis 3. The mean level of heart rate changes in the intervention groups in comparison with the control group has a statistically significant difference.

The findings of this study did not confirm this hypothesis. In fact the difference among groups was not significant in terms of changes in blood oxygen saturation. Perhaps this is because of the fact that the changes in blood oxygen saturation are deeper as compared with the changes in heart rate and need more prolonged stimulation. So the sharp pain of needle did not lead to changes in oxygen saturation in neonates of the present study. These findings are consistent with the results of the study of Efe and Özer (2007). Based on their findings, breastfeeding was ineffective on blood oxygen saturation changes caused by the DTP vaccine in infants. However, in their opinion, infants moving can reduce the accuracy of the pulse oximeter probe and can make the physiological changes insignificant in their study and this can also be true in this study (Efe & Özer, 2007). Chang (2007) also concluded that although swaddling could lead to stabilization of HR in infants of the present study, it had no effect on respiration rate and blood oxygen saturation (Chang, 2007).

Thakur, Sarin, and Kumar (2015) assessed the effect of swaddling on pain and physiological parameters in neonates during heel lance. Their results showed significant difference in heart rate and pain of the neonates with and without swaddling. Moderate positive correlation was found between heart rate and pain during heel lance although no significant relationship with oxygen saturation (Thakur et al., 2015). These results are consistent with the present study.

Based on the results of other studies regarding the effectiveness of non-pharmacological interventions on pain reduction and its physiological changes, it can be argued that the physiological changes in

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3 Combined</th>
<th>4 Control</th>
<th>p</th>
<th>Significant pairwise comparisons</th>
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<tr>
<td>Pain 15 seconds after vaccination</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>0.003</td>
<td>1 vs. 4 (p = 0.001)</td>
</tr>
<tr>
<td></td>
<td>(57.48)</td>
<td>(61.65)</td>
<td>(57.76)</td>
<td>(86.74)</td>
<td></td>
<td></td>
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<tr>
<td>Pain intensity 2 minutes after vaccination</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0.167</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(56.05)</td>
<td>(66.29)</td>
<td>(65.44)</td>
<td>(75.18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in heart rate at baseline injection</td>
<td>4</td>
<td>3.5</td>
<td>1</td>
<td>12</td>
<td>0.002</td>
<td>1 vs. 4 (p = 0.013)</td>
</tr>
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<td></td>
<td>(63.02)</td>
<td>(63.72)</td>
<td>(50.45)</td>
<td>(85.94)</td>
<td></td>
<td>2 vs. 4 (p = 0.016)</td>
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<td></td>
<td>3 vs. 4 (p &lt; 0.001)</td>
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</tr>
<tr>
<td>Changes in heart rate 2 minutes after injection compared to baseline</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.986</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(67.62)</td>
<td>(66.43)</td>
<td>(64.11)</td>
<td>(65.71)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in O2 saturation at baseline injection</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0.693</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(67.77)</td>
<td>(59.57)</td>
<td>(70.18)</td>
<td>(66.92)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in O2 saturation 2 minutes after injection compared to baseline</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>0.429</td>
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<td></td>
<td>(57.68)</td>
<td>(64.65)</td>
<td>(71.53)</td>
<td>(70.52)</td>
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comparison with behavioral changes cannot be a useful measure to assess pain, because physiological changes is not affected only by pain and painless factors also can cause these changes (Wong, 2011).

4. Conclusions

Although further work is required to gain a more complete understanding of the effect of nonpharmacologic pain management, our findings indicate that simple interventions such as breastfeeding within a short time before the painful procedure of vaccination or swaddling the neonates within the procedure decrease behavioral responses of pain (e.g., facial expression) and physiological parameters (e.g., heart rate) in healthy term neonates. Therefore it is recommended to take advantage of these two methods in reducing the pain induced by vaccination or other painful invasive procedures in healthy term neonates. Nurse practitioners can use this evidence to encourage breastfeeding mothers to use the act of nursing their infants as a distraction to the pain induced by routine immunizations in the primary care setting.

Conflict of interest

There is no Conflict of interest.

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