

## Non-Pharmacological Pain Management In Newborn

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Pain is a complex and multi-dimensional experience. Pain is an experience which affects all individuals child or adult in physical, emotional, and social ways and which brings fear, anxiety, and depression with it. For this reason, it is important to determine and evaluate the pain conditions of newborns urgently. Acceptable nursery approaches can be developed by examining physiological and behavioral variables, metabolic parameters, and hormone levels at pain. All health professionals are responsible for examining, removing, or reducing pain. The analgesics used for reducing the perception of pain are more effective when they are used with non-pharmacological techniques. The proof referenced application examples (kangaroo care, breast feeding, lactation, sucrose, position change, music, etc.) used by health professional independently is discussed in this article.

**Anahtar Kelimeler:** *Newborn; pain, nonpharmacological practice, evidence-based practice.*

### Yenidoğanda Non-Farmakolojik Ağrı Yönetimi

Ağrı insanoğlunun deneyimlediği karmaşık ve çok boyutlu bir olgudur. Ağrı, çocuk ya da yetişkin tüm insanların fiziksel, duygusal ve sosyal yönlerini etkileyen korku, anksiyete ve depresyon gibi ciddi ruhsal sorunları beraberinde getiren bir deneyimdir. Bu nedenle de yenidoğanın ağrı durumunun acilen değerlendirilmesi ve ele alınması önemlidir. Ağrı da fizyolojik ve davranışsal değişkenler, metabolik parametreler ve hormon düzeyleri değerlendirilerek uygun hemşirelik yaklaşımları geliştirilebilir. Yenidoğanların ağrı yönetiminde sağlık profesyonelleri ağrının değerlendirilmesi, ortadan kaldırılması ve azaltılmasından sorumludur. Ağrı algılamasını azaltmak için farmakolojik ve farmakolojik olmayan yöntemler birlikte uygulandıklarında etkinlikleri artmaktadır. Bu makalede sağlık profesyonellerinin yenidoğan ağrı yönetiminde bağımsız olarak kullanabilecekleri kanıta dayalı uygulama örnekleri (kanguru bakımı, emzik, sukroz, pozisyon değişikliği, müzik vs.) tartışılmaktadır.

**Key words:** *Yenidoğan; ağrı, farmakolojik olmayan uygulamalar, kanıta dayalı uygulama.*

Pain is a complex and multi-dimensional fact that men experience. Wall & Melzack define pain as an individual experience which is influenced by psychological and socio-cultural factors changing according to the load of tissue damage and the kind of damage, and which is defined by the individual himself (1). In addition pain is an experience which affects all individuals child or adult in physical, emotional, and social ways and which brings fear, anxiety, and depression with it. For this reason, it is important to determine and evaluate the pain conditions of newborns urgently (2).

It has been many years since it was believed that infant do not feel pain because of their immature nervous systems. We are known that fetal nervous system development begins very early in gestation at the time. Nerve fibers that innervate bone and skin and form the peripheral nervous system begin migration from the neural crest at about 7 weeks gestation. This migration process is complete by 20 weeks gestation. By 28-30 weeks, the density of nociceptive nerve endings is equal to that of adults (2-9).

Neonates in a neonatal intensive care unit are exposed to a high number of painful procedures. Neonatal intensive care involves a high number of diagnostic and therapeutic procedures which are associated with pain for the neonates concerned. For example, described an average of 134 painful procedures within the first two weeks of life for each of 124 preterm neonates with a gestational age of 27–31 weeks. In a study covering 54 neonates, more than 3000 painful interventions were documented during their entire hospitalization period, of which 74% involved preterm infants under 31 weeks gestation (10). Most of the painful interventions included capillary blood sampling by heel stick, followed by endotracheal suctioning.

When evaluating pain in newborns the most important problem to be addressed is that it is not a verbal response to pain. Newborns have a repertory for announcing their pain that is nonverbal. These are like those shown in Table I

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**Table 1.** Responses of Infants to pain (3, 11-14)

<b>Physiological changes</b>	<b>Behavioural changes</b>	<b>Biochemical Changes</b>
<b>Increase in:</b>	<b>Change in facial expression</b>	<b>Increased release of:</b>
* Heart rate	* Grimacing	* Cortisol
* Blood pressure	* Screwing up of eyes	* Catecholamines
* Respiratory rate	* Nasal flaring	* Glucagon
* Oxygen consumption	* Deep nasolobial groove	* Growth Hormone
* Mean airway pressure	* Curving of the tongue	* Renin
* Muscle tone	* Quivering of the chin	* Aldosterone
* Intracranial pressure		* Antidiuretic Hormone
	<b>Body Movements</b>	<b>Decreased secretion of:</b>
<b>Autonomic changes</b>	* Finger clenching	* Insulin
* Mydriasis	* Trashing of limbs	
* Sweating	* Writhing	
* Flushing	* Arching of back	
* Pallor	* Head banging	

There are various factors in newborns' perception of pain and their formation of a response. These factors are the infant's gestation, gender, state of wakefulness, type of painful stimulus, length and general health status, type of birth, severity of illness, past experiences, individual differences and coping skills (11-15).

To evaluate newborns' sense of pain, behavioral and physiologic variables can be more beneficial in the evaluation of short term pain, and hormone levels and metabolic parameters can be more beneficial in the evaluation of pain that lasts for hours or days (11, 13). Studies directed at the measurement and evaluations of pain in newborns are increasing the national and international studies researching the development of and the validity and reliability of these measures.

The severity of pain cannot be measured objectively like body temperature, blood pressure and heart rate. For this reason it is necessary for pain to be well defined to be able to check for it. Various methods have been developed to help in the determination of pain severity and to overcome the problem of definition. These are given in Table II.

**Table 2.** Pain Assessment Scales In Infants (14)

<b>Based On Behavioural Changes</b>
* Neonatal Facial Coding System ( <b>NFCS</b> )
* Infant Body Coding System ( <b>IBCS</b> )
* Neonatal Infant Pain Scale ( <b>NIPS</b> )
* Pain Assessment in Neonates ( <b>PAIN</b> )
* Liverpool Infant Distress Scale ( <b>LIDS</b> )
* Neonatal Assessment of Pain Inventory ( <b>NAPI</b> )
* Behavioural Pain Score
* Clinical scoring system
<b>Combination of physiological and behavioural changes</b>
* <b>CRIES</b>
* Pain Assessment Tool ( <b>PAT</b> )
* Premature Infant Pain Profile ( <b>PIPP</b> )
* Scale For Use in Newborns ( <b>SUN</b> )

### **Pain Management of Newborn**

The goal in newborn pain management is to help lessen the pain and to help the infant cope with pain. For this all health care professionals are responsible for evaluating pain, and to the extent possible, for alleviating and decreasing pain (1, 16).

Newborns experience pain during frequent invasive procedures. Many pharmacologic and non-pharmacologic methods are used to decrease pain during invasive procedures (1, 13, 17, 18).

All members of the team are responsible for alleviating pain with pharmacologic methods. The nurse, as a member of the team, needs to know how to control pain with pharmacologic methods and needs to share this information with other members of the team in an effective manner (1, 17).

All interventions that are done to control pain without the use of medications are called non-pharmacologic interventions. Non-pharmacologic techniques that are used to decrease the perception of pain increase the effectiveness of medications that are used together with analgesics (14).

### Non-pharmacologic Methods

**Positioning:** It has been determined that changing the position of a newborn in pain provides significant comfort to the infant. The prone position decreases pain and stress after invasive procedures and provides stability (14, 19). Although Grunau et al. (2004) were unable to confirm the effect of the prone position. The evidence for the effect of "positioning" remains inconclusive (20).

**Olfactory and multisensorial stimulation:** In accordance with study results which showed a stress-relieving effect of the smell of breast milk, Goubet et al. (2003) tested the hypothesis that a familiar odour might be effective in relieving distress associated with painful stimuli in preterm infants (21). Bellieni et al. (2001) specify that the assessment of the intervention of "multisensorial stimulation" was not blinded, which is to be criticized as a clear bias and calls into question the efficacy of this non-pharmacological intervention as described (22).

**Kangaroo care and maternal touch:** "Kangaroo care" involves the neonate being taken out of the incubator and laid on the bare skin of the mother or father (3, 23, 24). The neonate is covered with towels so that there is no loss of body temperature. A study of 74 preterm neonates older than 32 weeks gestation confirmed that "kangaroo care" produces a reduction in pain response, using the "Premature Infant Pain Profile" as a validated pain assessment tool (23). One meta-analysis described the greatest pain-relieving effect occurring with "maternal calming" rather than with "swaddling" and "positioning", but the effect dropped off more rapidly in comparison with the other two interventions, where it was sustained over 4–5 min (25)

**Massage;** Rhythmic and repetitive movements are thought to have an effect on decreasing pain by calming and decreasing crying (26).

**Non-nutritive and nutritive sucking:** Non-nutritive sucking" refers to the placement of a pacifier in an infant's mouth to promote sucking behaviour without breast or formula milk to provide nutrition. As a result of "non-nutritive sucking", they become calmer and more attentive, and a reduction in crying was observed (10). The use of a sucking has been determined to increase the release of serotonin which directly or indirectly decreases the transmission of painful stimuli. "Non-nutritive sucking" on a pacifier or a cotton wool stick also resulted in a significant reduction in the pulse rate and seems to be highly effective (10).

**Sweet substances:** It has been determined that sugar or other sweet substances alone or with a pacifier decreases pain caused by painful procedures in newborns (7, 24). A research was obtained by Huang et al. (2004), who found in their study of 32 preterm infants that swaddling was even effective, as measured by the "Premature Infant Pain Profile", for infants younger than 31 weeks (10). Swaddling is described as having an effect on oxygen saturation for all age groups (10).

**Mother's milk:** Mother's milk has been seen to have an analgesic effect that decreases pain in newborns (3, 27).

**Decreasing environmental stimuli:** Stimuli such as bright lights and noise may be the cause of excessive stimulation of newborns. For this reason decreasing environmental stimuli can calm an infant and indirectly decrease pain (11).

**Music:** Regardless of the type of music, a positive effect on the pain response was invariably recorded, such as the regulation and reduction of the pulse rate, a more rapid reversion of physiological parameters to the initial values, a rise in oxygen saturation and a reduction in the excitation state (12, 26). "Music" decreased the pain response particularly when combined with non-nutritive sucking shown by the "Neonatal Infant Pain Scale" (10).

**Facilitated tucking:** The researches describe facilitated tucking as an effective pain-relieving intervention. "Facilitated tucking" leads to a significant reduction in the pulse rate (10). The study used the "Premature Infant Pain Profile" as an outcome measure of pain. Among a group of 40 incubated and ventilated preterm neonates between 23 and 32 weeks gestation, "facilitated tucking" during endotracheal suctioning achieved significant pain relief (10).

There is a lot of evidence in the literature about methods of pain management in newborns. Some examples of these studies are shown in Table III.

**Table 3.** The use of evidence based applications in pain alleviation of infants (8, 18, 24, 27-34).

<b>AUTHOR'S (YEAR)</b>	<b>PURPOSE</b>	<b>SAMPLE/METHOD</b>	<b>MAIN FINDINGS SIGNİFİCANT RESULT</b>
<b>Taddio et al (1998)</b>	To determine the efficacy 5 percent lidocaine–prilocaine cream (Emla) in neonates undergoing circumcision.	68 newborns/ Behavioral (facial activity and time spent crying) and physiologic (heart rate and blood pressure) responses were recorded during the procedure.	Lidocaine–prilocaine cream is efficacious and safe for the prevention of pain from circumcision in neonates (p<0.001)
<b>Gray et al (2000)</b>	To determine whether skin to skin contact between mothers and their newborns will reduce the pain experienced by the infant during heel lance	30 newborn/ crying, grimacing, and heart rate	Skin-to-skin contact is a remarkably potent intervention against the pain experienced during heel stick in newborns.
<b>Lindh et al (2000)</b>	To investigate the effect of EMLA on the pain response when venipuncture was performed in healthy newborns.	60 newborns/ crying, heart rate	EMLA decreases the stress response during venipuncture in newborn infants.
<b>Savaşer (2000)</b>	To determine the effect of being in mother's arms in calming of newborn during heel stick procedure	70 newborns/ heart and respiratory rate and NIPS	The combination of pacifier and being in Mother's arms during the procedure was more effective in reducing pain than giving of pacifier alone lying in the bed.
<b>Özdoğan (2001)</b>	To determine the effect of breastfeeding and in newborn infants undergoing heel lance	142 newborns/ crying during and NFCS	Sucrose effectively reduces response to pain during invasive procedure in term neonates.
<b>Yılmaz et al (2002)</b>	To determine factors influencing the duration of crying of infants after heel lance	30 newborns/ crying during	It can be concluded that holding the baby in arms in the upright position may decrease the duration of crying during heel lance(p<0.001)
<b>Johnston et al (2002)</b>	To determine the efficacy of sucrose analgesia for procedural pain during the first week of life in preterm neonates	107 preterm neonates/ (<31 weeks' postconceptional age) / Sucrose (0.1 mL of 24%) or sterile water / Neuro-Biological Risk Score (NBRS)	Repeated use of sucrose analgesia in infants <31 weeks' PCA may put infants at risk for poorer neurobehavioral development and physiologic outcomes.
<b>Carbajal et al (2003)</b>	To investigate whether breast feeding is effective for pain relief during venepuncture in term neonates.	180 term neonates/breast fed, mother's arms without breastfeeding, 1 ml sterile water and %30 glucose /PIPP score and Doeleur Aigue Nouveau ne scale	Breast feeding effectively reduces response to pain during minor invasive procedure in term neonates.
<b>Johnston et al (2003)</b>	To test the efficacy of maternal skin to skin contact on diminishing the pain response of preterm neonates to heel lance	74 preterm neonates (32and 36 weeks' postmenstrual age)/ PIPP scores	Preterm neonates KC seems effectively decrease pain from heel lancing.
<b>Uyan et al (2005)</b>	To compare the effect of foremilk; hind milk and sterile water in reducing pain in newborns undergoing minor painful procedures.	Sixty-two infants/ to receive 2 ml of foremilk, hind milk or sterile water/ crying time, heart rate, and neonatal facial coding system scores.	It is concluded that neither foremilk nor hindmilk is superior in relieving pain when compared to placebo.

## Responsibility Of Nurses In The Management Of Newborn Pain

For effective pain management it is important for pain that newborns experience to be recognized correctly and in a timely manner. For nurses to have an effective role in the management of pain in newborns and infants, the evaluation, treatment and choice of appropriate interventions for pain begins with a care plan. A multidisciplinary team approach is necessary for interventions in the treatment of newborn pain to be at the desired level. In this context nurses need to

- \* Give consideration to evidence based practice and follow studies conducted in this area
- \* Ensure there is individualized developmental care
- \* Without forgetting that only one physiologic change can be a sign of pain, assume that the infant may be in pain when there are physiologic changes
- \* Continually evaluate for and compare changes that develop with pain
- \* Distinguish between signs of pain and signs of agitation and irritation
- \* Administer effective and timely pharmacologic and nonpharmacologic pain management strategies and continually evaluate the care plan

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- \* By giving treatment to infants in the same room at the same time, prevent the infants from being continually woken up
- \* Cooperate with parents at every phase of infant care and having the participate in care
- \* Correct wrong beliefs and ideas about pain that patient's relatives or other team members have and make changes in the Newborn Intensive Care Unit to decrease stimuli such as noise and light as much as possible ( 1, 3, 10-12, 14).

This article shows the view that the non-pharmacological methods described are to some degree beneficial to neonates who undergo painful procedures.

In conclusion, pain in newborns needs to be correctly recognized for effective pain management with a multidisciplinary team approach and factors that cause pain need to be decreased as much as possible. In painful situations the infant's condition needs to be evaluated and a plan of care needs to be determined using pharmacologic and non-pharmacologic methods.

In addition it is recommended that health care personnel who work with newborns implement evidence based practices on the subject of the effect of pain on newborn development, the signs of pain and pain management in newborns.

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