

# Pain Management Perceptions of the Neonatal Nurses in NICUs and Neonatal Units in Ardebil, Iran

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## ABSTRACT

**Background:** Despite the growing knowledge on pain assessment and intervention, neonatal pain remains unrecognized and under-treated. This study aimed to determine the knowledge and practice of the neonatal nurses in pain assessment and management.

**Methods:** This cross-sectional descriptive study was conducted on 120 neonatal nurses working in the Neonatal Intensive Care Units (NICUs) and neonatal units in Ardebil, Iran, using the census method. For data collection, Nurses' Perceptions of Neonatal Pain questionnaire developed by Cong was employed, which includes two open ended and 36 Likert scale questions. The collected data were analyzed, using descriptive statistics (frequency and percentage) and qualitative content analysis method.

**Results:** As the results of the study indicated, the nurses had adequate level of knowledge about the neonatal pain. However, less than 50% of them believed receiving suitable training on this issue. The majority of the participants reported that they did not use any pain assessment tools (65%). Less than half of them expressed that the pain assessment tools used in their units were accurate measures (44.2%). Likewise, less than half of the nurses reported that pain was well managed in their institution (28.3%) with evidence-based protocols (34.2%). In addition, more than half of the subjects reported that parents should be involved with the care and comfort of their infants during the painful procedures (71.6%).

**Conclusion:** Nurses' perceptions of well-managed pain had a significant relationship with adequate training, use of appropriate and accurate pain tools, clear and evidence-based protocols, and parent involvement.

**Keywords:** Neonatal, NICU, Nurses' perceptions, Pain management

## Introduction

Pain management is an important issue, especially for the neonates since they are unable to express their pain verbally. The traditional view that neonates are incapable of perceiving pain has been refuted and there is now no doubt about their pain perception (1, 2). Although the infants do not verbalize, they reveal their vulnerability to pain through specific behaviors and physiologic changes (3). The behavioral responses consist of changes in sleeping/waking patterns, crying, body and limb movement, and facial expressions (4). The physiological indicators of pain include autonomic

changes in the heart and respiratory rates, blood pressure, and oxygen saturation. There are also hormonal responses to pain, which need a laboratory evaluation to make an informed judgment.

High-risk neonates in the Neonatal Intensive Care Unit (NICU) are subjected to numerous invasive procedures as part of their care process. According to the literature, the neonates in the NICU, especially the preterm ones, averagely undergo 10-16 painful procedures per day during the early days of their lives. Furthermore, several studies demonstrated

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that the neonates can detect, process, and respond to the painful stimuli. The preterm neonates may actually have a pain threshold that is 30-50% lower than that of the adults and a lower pain tolerance, compared to the elder children (5-7).

The studies in the recent years have confirmed that the neonates, especially when preterm, are more sensitive to nociceptive stimuli than the elder children. Neonates are capable of mounting robust physiological, behavioral, hormonal, and metabolic responses to such stimuli; responses that can have adverse short- and long-term effects. Several lines of evidence suggest that early and repeated exposure to painful stimuli during a period, which is fundamental to nervous system development, leads to persistent behavioral changes and a shortening of the sensory area of the brain in ex-preterm infants (8). It is well established that the preterm neonates show greater sensitivity to pain, compared to the full-term ones (9).

Despite the growing knowledge about pain assessment and intervention, the neonatal and infant pain remains unrecognized and undertreated (7, 10). Regarding this, managing the infant pain is still a challenge for the neonatal care providers because these infants cannot verbally communicate their pain and speak for themselves. Nurses are the most consistent caregivers for the neonates; as a result, their pain assessment skills and the relevant practices are critical for this vulnerable population. The number of studies investigating the knowledge and attitudes of the health care providers about neonatal pain assessment and management is limited (11).

More than half of the surveyed nurses in California reported that pain was not adequately managed in the NICUs, which was ascribed to lack of evidence-based pain management protocols/guidelines (12). Another study showed that the majority of Australian NICUs had no articulated policy to guide pain management (13). Nurse-physician collaboration and nurses' work assignments were concluded to be predictive of evidence-based pain care in Canada (14). In addition, fewer than half of the surveyed nurses in the United States reported that pain was well managed in their unit with evidence-based protocols (5).

The prevention of pain in the neonates is an expectation of the parents. However, there are major gaps in our knowledge regarding the most efficient way to accomplish this goal (10). The aim of this study was to investigate neonatal nurses perceptions of knowledge and practices related to pain assessment and management in the Ardebil in Iran.

## Methods

A cross-sectional descriptive study design was used in the study. A total of 120 neonatal nurses who working in NICUs & neonatal units in Ardebil province, (Iran) were selected using the census sampling technique. A questionnaire of Nurses' Perceptions of Neonatal Pain (5), including 36 questions with Likert scale and 2 open ended questions, was used. The questionnaire was designed to focus on 5 aspects of nurses' perceptions of neonatal pain: (1) knowledge and beliefs; (2) use of assessment tools; (3) use of pharmacologic and nonpharmacologic interventions; (4) guidelines/protocols and family involvement; and (5) barriers and strategies

The 5-point Likert scale questions targeted neonatal pain knowledge, assessment, intervention, and guidelines. On the other hand, the two open-ended questions explore the potential barriers to pain management and strategies that could be used to raise the awareness of the care providers about the effective pain interventions in the clinical units. After obtaining the permission of the tool designer, the questionnaire was translated into Persian based on the Wild and colleagues' protocol. For ensuring the accuracy of the translation, the back translation (from Persian to English) was performed by two bilingual (Persian and English) members of the research team.

The validity of the questionnaire was evaluated, using content validity, i.e., the questionnaire was given to 10 pediatric nursing faculty members who were expert at tool design and their comments were applied accordingly. Consequently, the content validity index was estimated to be 0.97. The reliability of the Persian version of this instrument was examined with the Cronbach's alpha coefficient ( $\alpha=0.84$ ).

The demographic characteristics form included such information as gender, age, education background, and years of experience in the NICU. To follow the ethical principles, participation in the study was completely anonymous and voluntary. After obtaining the permission from the ethical committee of the nursing school, the objectives of the study were fully explained to the neonatal nurses. Subsequently, their informed consents were taken and they were ensured about the confidentiality of the collected data. All the subjects working in the NICUs and neonatal units were asked to fill in the questionnaire and hand it to the researchers. The data collection period lasted for 3 months.

Data analysis was performed, using descriptive statistics (for quantitative data through SPSS

version 19) and qualitative content analysis method, which categorizes the recurring themes. To this aim, two coders, a PhD student and the first author, conducted the coding and the reliability of this procedure was determined by estimating the amount of agreement between the two coders.

### Results

In total, 120 female neonatal nurses participated in the present study. The demographic characteristics of these participants are illustrated in Table 1. According to Table 1, 75.8% of the participants were married and the majority of them had bachelor's degree with 1-5 years' work experience.

Demographic Characteristics	n(%)	No.Responsen (%)
Gender		
Female	120(100)	-
Male	-	
Age (week)		
<30	54(45)	
41-35	29(24.2)	5(4.2)
36-40	23(19.2)	
<40	9(7.5)	
Education		
Bachelor's	112(93.3)	-
Master's	5(4.2)	
Other	3(2.5)	
Neonatal practice (years)		
<1	24(20)	
1-5	36(30)	
6-10	29(24.2)	-
11-15	6(5)	
>15	2(1.7)	
Marriage		
Single	28(23.3)	1(0.8)
Married	91(75.8)	
Other	-	

**Table 2.** Knowledge and beliefs about neonatal pain

Questions	Strongly Agree/Agree n (%)	Neutral n (%)	Strongly Disagree/Disagree n (%)
Neonates are capable of experiencing pain.	113(94.2)	4(3.3)	3(2.5)
Minor procedures can cause pain.	108(90)	4(3.3)	8(6.7)
Preterm neonates are at a greater risk of neurodevelopmental impairment due to repeated painful procedures.	35(29.2)	21(17.5)	64(53.4)
Neonates, especially preterm infants, are more sensitive to pain than older children and adults.	95(79.1)	16(13.3)	9(7.5)
Neonatal pain has long-term adverse effects.	81(67.5)	15(12.5)	24(20)
I received adequate training regarding neonatal pain assessment when I was oriented to my unit.	40(33.3)	10(8.3)	70(58.3)
My unit provides continuing education regarding neonatal pain management.	32(26.6)	10(8.3)	78(65)

**Table 3.** Nurses' perceptions of pain assessment in the NICU

Questions	Strongly Agree/Agree n (%)	Neutral n (%)	Strongly Disagree/Disagree n (%)
My unit uses a neonatal pain assessment tool regularly.	22(18.3)	20(16.7)	78(65)
I feel confident with my skills in recognizing the physiologic/ behavioral indicators of neonatal pain.	80(66.6)	31(25.8)	9(7.5)
I am confident in my ability to interpret scores obtained from pain assessment tools.	49(40.8)	41(34.2)	30(25)
I feel confident in my use of the neonatal pain assessment tool in my unit.	35(29.1)	37(30.8)	49(40)
The pain assessment tool in my unit is an accurate measure	27(22.5)	40(33.3)	53(44.2)

### A. Knowledge and Beliefs about Neonatal Pain

Ninety-four and two-tenths of a percent of the nurses stated that neonates are able to experience pain. Accordingly 79.1% of these participants agreed that newborns especially premature infants are more sensitive to pain than older children and adults and that pain in infancy has long term side effects. 33.3% of the nurses reported that in the course of orientation with the unit, they received necessary training in recognizing pain in newborns and 65% of them stated that they received continuing education about pain management (Table 2).

### B. Neonatal Pain Assessment

Sixty-five percent of the participants said they didn't use pain assessment tools but they felt confident about identifying and assessing physiological or behavioral indicators of pain. Nevertheless, 44.2% of nurses believed that the tools that used in their unit for pain assessment were inappropriate for neonates and disagreed that the tool can accurately assess pain in infants (Table 3).

### C. Neonatal Pain Intervention

Sixty-Fourth one-tenth percent of the participants considered that pharmacologic/non pharmacologic interventions are necessary even if many invasive procedures can be performed quickly; they felt confident in the use of these pain interventions. 78.4% of the nurses agreed that Non pharmacological pain management is effective to manage neonatal pain. But, 28.3% of them reported that the neonatal pain in their units was well managed (Table 4).

of neonatal pain.

**Table 4.** Nurses' perceptions of pain interventions in the NICU

Questions	Strongly Agree/Agree n (%)	Neutral n (%)	Strongly Disagree/Disagree n (%)
Pharmacologic/non-pharmacologic interventions are necessary even though many invasive procedures can be completed quickly.	16(13.3)	27(22.5)	77(64.1)
I am aware of pharmacological treatments available for neonatal pain.	91(75.8)	7(5.8)	22(18.3)
I feel confident with my skills in pain management using pharmacological interventions	72(60)	30(25)	18(15)
Non-pharmacological pain management is effective in neonatal pain management.	94(78.4)	18(15)	8(6.7)
I feel confident with my skills in pain management using non-pharmacological interventions	84(70)	21(17.5)	15(12.5)
I feel that the neonatal pain in my unit is well managed.	34(28.3)	10(8.3)	76(63.3)

**Table 5.** Guidelines/protocols and parental involvement in pain management

Questions	Strongly Agree/Agree n (%)	Neutral n (%)	Strongly Disagree/Disagree n (%)
I am aware of the pain management guidelines/protocols in my unit	35(29.2)	27(22.5)	58(48.4)
The pain management guidelines/ protocols in my unit are clear and comprehensive	39(32.5)	22(18.3)	59(49.1)
The pain management guidelines/protocols in my unit are based on new research evidence	41(34.2)	35(29.2)	44(36.7)
I feel that making changes in relation to pain management in my unit can be initiated easily	68(56.6)	39(32.5)	13(10.8)
Parents are emotionally affected by the pain their infant may be experiencing	107(89.2)	10(8.3)	3(2.5)
The prevention of pain in neonates is an expectation of parents	111(92.5)	6(5)	3(2.5)
Parents should be involved with the care and comfort of their infant during painful procedures	86(71.6)	16(13.3)	18(15)

#### D. Neonatal Pain Guidelines/Protocols and Family Involvement

Forty-eight and four-tenths percent of the participants were not aware of the pain management guidelines/protocols on their units and disagreed that the protocols in their unit were clear and comprehensive. 34.2% of the subjects felt that the protocols were based on new research evidence.

71.6% of the nurses agreed that parents should be involved in providing care and comfort during painful procedures and 92.5% of them agreed that the prevention of pain in neonates is an expectation of parents (Table 5).

#### E. Barriers and Strategies

Content analysis of the narrative data revealed six main themes, which were perceived as barriers to effective pain management. These barriers included: 1) high workload, 2) shortage of personnel, 3) lack of knowledge, 4) the absence of pain protocols, 5) lack of time, and 6) lack of trust in the pain assessment tools.

Six main perceived strategies to improve pain management emerged from 120 respondents' data: (1) providing education; (2) using/disseminating current research; and (3) develop guidelines and support of nurses, (4) develop clinically feasible pain tools, (5) Provide adequate staff and proper

workload (6)Supervision and appropriate monitoring.

#### Discussion

This study aimed to investigate neonatal nurses' perceptions of knowledge and practice in pain assessment and management in NICU. As the findings of this study demonstrated, the nurses were generally aware of the pain care and had a positive attitude towards it, which is consistent with the findings of Byrd et al. (2009), Akuma and Jordan (2012), Pölkki et al. (2010), Schultz et al. (2010), and Cong et al. (2013) (5, 12, 15-17). Furthermore, it was demonstrated that the care providers' knowledge and perceptions of the neonatal pain have changed dramatically in the past several decades (5).

The present study showed that some nurses confirmed the ability of the neonates to feel pain and the long-term adverse effects of pain. Nevertheless, in another study, 25% of the participants were unaware of the fact that a preterm neonate could be more sensitive to pain than a full-term one (16). In another study, the nurses were concluded to enjoy adequate knowledge of general neonatal pain concepts; however, they had deficient knowledge regarding several topics (e.g., the higher sensitivity of the preterm neonates to pain and long-term consequences of pain) (11). Clarifying these crucial concepts may help the nurses to assess pain in their

most vulnerable patients and take appropriate therapeutic measures.

Pain has been recognized as the “fifth vital sign” that should be routinely monitored in the clinical examination (5). There is a plethora of pain assessment tools for both term and preterm neonates. However, these tools are underutilized due to the lack of knowledge, failure to prioritize pain management, lack of time, uncertainty about the validity of available scales, and concerns that tools may be measuring sub-cortical reflexes rather than conscious perception of pain (15).

The majority of the nurses in this study reported that they did not use assessment tools regularly. Similarly, several studies demonstrated that pain assessment tools were used only by a small proportion of the clinicians and NICU nurses (13, 15, 16). On the other hand, in a study conducted in the United State, Cong et al. (5) reported higher use of these tools. However, a few of the participants considered assessment tools as appropriate and accurate. The low rate of using pain assessment tools observed in the current study may be due to lack of clinically feasible tools and inadequate training.

Despite the availability of neonatal pain scales, they are rarely used in the clinical practices. According to the results of the surveys conducted in France, Italy, Australia, United Kingdom, and Japan, only a few respondents reported using pain assessment tools for the neonates (6, 13, 15, 18). For instance, Akuma and Jordan (2012) argued that only 2.5% of the clinicians reported to use pain assessment tools. Most tools were either local adaptations or combinations of the validated pain assessment tools (15).

In a survey conducted in Finland, the same results were obtained, i.e., pain assessment was concluded to be unsystematic and only a few nurses used the pain assessment tools in the NICUs (16). A different result was reported in an Australian study, which indicated that about half of the respondents considered pain assessment tools to be reliable and valid (17). There are several reasons for the failure to adopt pain assessment tools in actual clinical situations. It is possible that the majority of these tools have been developed for research purposes. As a result, they are difficult to use or inconvenient for the neonates requiring mechanical ventilation and other special requirements in the NICU (19).

Franck and Bruce (2009) argued that poor compliance with the pain assessment maybe indicative of resistance to using scales, which are often inaccurate or perhaps ignore the clinical expertise and experience (20). Therefore, one

solution to this problem could be the development of an assessment tool in close collaboration with the clinical staff. In addition, it is important to integrate the pain assessment tools with pain management strategies that may be a contributing factor to the use of standardized tools in the routine clinical practice (19).

Delivery of neonatal care demands attention to nursing interventions, which effectively reduce pain. Pharmacological and non-pharmacological methods are used to decrease pain among the preterm neonates during invasive procedures. Nurses and other healthcare professionals need to know how to control pain with both pharmacological and non-pharmacological methods (21).

The majority of the participants in this study was aware of the pharmacologic treatments and felt confident in using them. Regarding the non-pharmacologic interventions, the majority of the nurses acknowledged their superiority over pain medications. Likewise, a large body of evidence demonstrated the analgesic effects of non-pharmacologic methods including kangaroo care, (22, 23) breastfeeding (24), and multi-sensory stimulation (25). However, this kind of intervention was less frequently recognized as useful in some studies (13, 17). Lago et al. (6) showed that routine use of preventive pharmacological and non-pharmacological measures for painful procedures ranged from 13% for elective tracheal intubation to 68% for chest tube insertion. Similarly, in another study, it was demonstrated that medication was not usually prescribed for the procedural pain (26).

Furthermore, in the present study, less than half of the participants expressed that the neonatal pain was well managed in their units, which is similar to the results of the studies carried out in California (12) and the United States (5). Since the need for adequate analgesia is still underestimated, further information on the safety of analgesics in neonatology is imperative as is adequate education of physicians and nurses on the use of pain control guidelines as part of the standard of care in the NICU.

Fewer than half of the participants reported that their pain management protocols were evidence-based, clear, and comprehensive. Absence of evidence-based pain management guidelines in the NICU has also been reported in the previous studies (12, 13, 15). In a study conducted in the United States and China, less than half of the subjects stated that pain management guidelines/protocols were evidence-based (11). The neonatal nurses need to effectively institute evidence-based interventions in the NICUs, especially to include parent involvement

in the pain management protocols.

In the current study, more than half of the nurses reported that parents should be involved with the care and comfort of their infant during the painful procedures. Similarly, in another study, most of the subjects agreed that parents should be involved with their infants' pain care (11). Another study showed that Nurses' proper response to parents' questions about the infant's condition reduced stress among parents (27). A study in the US A study in the United States showed that both longer and shorter kangaroo care before and throughout the painful procedures can be helpful in reducing the behavioral and physiological pain responses in the preterm neonates (22). Also, Kangaroo care could be practiced at home as a simple and safe method of diminishing the fussiness and crying time in colicky infants (28). These findings suggest that in addition to other pain management practices, parent involvement independently contributes to improve neurobehavioral outcomes in the high-risk infants.

Consistent with the previous studies, the barriers to effective pain management were found to be high workload, shortage of personnel, lack of knowledge, absence of pain management protocols, lack of time, and lack of trust in the pain assessment tools (5, 11-12). These barriers can be resolved by developing guidelines and support of nurses, developing clinically feasible pain tools, as well as providing adequate training and proper supervision. Other studies have also underscored the need for educating the neonatal clinicians regarding the pain assessment and practices (12, 17) and promoting nurse-physician collaboration (14).

## Conclusion

According to the findings of the present study, the nurses acknowledged that it is the responsibility of NICU nurses to support pain management in the newborns. Nurses' perceptions of well-managed pain had a significant relationship with adequate training, use of appropriate and accurate pain tools, clear and evidence-based protocols, and parent involvement. Furthermore, barriers to effective pain management can be resolved by developing guidelines and support of nurses, developing clinically feasible pain tools, as well as providing adequate training and proper supervision. Consequently, the nurses must be empowered with the knowledge of how to obtain, disseminate, and implement evidence-based protocols within their clinical settings.

## Acknowledgments

This article was part of a PhD dissertation by Nasrin Mehrnoush, supervised by Dr. Tahereh Ashktorab in Shahid Beheshti University of Medical Sciences with ethics code of SBMU2.REC.139489. Hereby, the researchers extend their gratitude to all the participants who willingly devoted their time for this study.

## Conflicts of interests

The researchers of the present study declare no conflicts of interest.

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