

Does Recognition Lead to Relief? Healthcare Workers' Knowledge, Perception, Attitudes and Practices in Neonatal Pain Management in Northeast Nigeria

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Abstract

Introduction: Neonates undergo repeated painful procedures during hospitalisation, yet recognition of pain may not translate into appropriate assessment and treatment. This study assessed healthcare workers' knowledge, pain perception, attitudes and practices regarding neonatal pain management and examined associated professional and organisational factors.

Methods: A descriptive cross-sectional study was conducted among 50 doctors, nurses and midwives providing neonatal care in a tertiary neonatal unit in Northeast Nigeria. A structured questionnaire and observation checklist assessed factual knowledge, procedural pain perception, attitudes, self-reported practice and observed practice. Associations between domain scores and sociodemographic and professional characteristics were examined, while adjusted logistic regression assessed associations of neonatal pain training and guideline/protocol availability with the five study outcomes.

Results: Pain perception had the highest proportional mean score (86.7%), followed by attitude (82.1%), self-reported practice (61.1%), factual knowledge (53.0%) and observed practice (46.8%). Only 32.0% of respondents reported using a standard pain scale and 20.0% documented pain scores; during observed practice, pain-assessment tools were used in 26.0% and pain-related findings and actions were documented in 38.0%. Analgesia was used more frequently for major invasive procedures but poorly for venepuncture (39.1%) and nasogastric-tube insertion (34.7%). Professional cadre was associated with factual knowledge ($p=0.004$), while SCBU experience was associated with pain perception in the overall analysis ($p=0.041$). Neither training nor guideline/protocol availability was significantly associated with the five study outcomes in adjusted analyses.

Conclusion: A clear gap existed between recognition of neonatal pain and its consistent assessment and relief. Despite high pain-perception and attitude scores, important gaps remained in factual knowledge, standardised assessment, documentation and analgesic practice. A systems-based approach combining multidisciplinary training, validated pain-assessment tools, procedure-specific protocols, reliable access to analgesia and regular clinical audit may improve routine neonatal pain care.

Introduction

Pain is defined by the International Association for the Study of Pain as “an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage”.¹ Although neonates cannot verbally report pain, neuroanatomical and neurophysiological evidence demonstrates that the pathways required for nociception are present before birth.^{2,3,4} Neonates respond to painful stimuli through measurable behavioural, physiological, metabolic and hormonal changes, including altered facial expression, crying, limb movement, heart rate, blood pressure and oxygen saturation.^{2,3,4,5} Preterm infants may be particularly vulnerable because excitatory pathways develop before descending inhibitory mechanisms mature, making repeated painful exposure during a critical period of brain development potentially harmful.^{3,4} Neonates admitted to special-care or intensive-care units undergo repeated diagnostic, therapeutic and nursing procedures, including heel lance, venepuncture, intravenous cannulation, suctioning, lumbar puncture, endotracheal intubation and chest-tube insertion. When pain is inadequately prevented or treated, it can cause immediate cardiorespiratory and metabolic instability and may alter later pain processing, stress regulation, sensorimotor development and cognitive or behavioural outcomes.^{3,5,6} Effective prevention and treatment of neonatal pain are therefore both a clinical responsibility and an ethical component of quality newborn care.

Pain assessment in neonates is challenging because it depends on the interpretation of non-verbal signs. Several validated multidimensional tools combine behavioural and physiological indicators, but no single instrument is suitable for every gestational age, clinical condition and type of pain.⁷ Consequently, healthcare workers require appropriate knowledge, training and clinical judgement, supported by standardised institutional protocols. Recommended neonatal pain programmes include minimising avoidable procedures, assessing pain routinely, documenting pain scores, using procedure-appropriate non-pharmacological and pharmacological interventions, reassessing response to treatment, involving parents and providing continuing education to healthcare workers.^{8,9,10}

Despite established recommendations, neonatal pain remains under-assessed and undertreated. Studies have reported inconsistent use of validated pain scales, inadequate documentation and the performance of painful procedures without specific analgesia.^{10,11,12} These gaps may be more pronounced in resource-limited settings because of restricted training opportunities, absent local protocols, limited availability of analgesics, workload and competing priorities related to neonatal survival. Evidence describing the knowledge and clinical practices of healthcare workers in sub-Saharan Africa remains limited, particularly in Nigeria.

Understanding the relationship between healthcare workers' knowledge, perceptions, attitudes and actual practices is necessary for designing locally appropriate interventions. This study therefore assessed neonatal pain-management knowledge, procedural pain perception, attitudes, self-reported and observed practices, organisational capacity and barriers among healthcare workers providing neonatal care in our hospital, North-East Nigeria.

Methods

Study design and setting

We conducted a descriptive cross-sectional study among healthcare workers providing neonatal care in the Special Care Baby Unit (SCBU) of Abubakar Tafawa Balewa University Teaching Hospital (ATBUTH), Bauchi, North-East Nigeria, from January to March 2025. The hospital is a major tertiary referral centre for newborn care in Bauchi State and neighbouring states. Its neonatal unit provides components of level II and level III care, including assisted feeding, intravenous fluids and antibiotics, oxygen therapy, phototherapy, continuous positive airway pressure and care for critically ill and preterm neonates. The unit admits both inborn neonates and referrals from other healthcare facilities.

Study population and eligibility criteria

The study population comprised doctors, nurses and midwives providing clinical care to newborns at ATBUTH during the study period. Healthcare workers who were available during data collection, consented to participate and completed the questionnaire were included.

Sampling method and sample size

A total-population sampling approach was used. All eligible healthcare workers providing neonatal services at ATBUTH during the study period were invited to participate. Fifty healthcare workers completed the questionnaire

and were included in the analysis.

Data collection tools and procedure

Data collection instrument

Data were collected using a structured self-administered questionnaire adapted from previously published neonatal pain-management instruments and an observation checklist.^{13,14,15} No pretest was conducted. The instrument covered: sociodemographic and professional characteristics; organisational factors; factual knowledge of neonatal pain neurophysiology, pharmacotherapy, comfort measures and pain markers; perception of pain associated with common neonatal procedures; attitudes towards neonatal pain management; self-reported pain-assessment and pain-relief practices; frequency of analgesia use for specific procedures; observed pain-management practices; and reasons for not administering analgesia. Knowledge items used Yes/No/Don't know responses. Procedural pain was rated as not painful, painful or extremely painful. Attitude statements used a five-point Likert scale from strongly disagree to strongly agree. Practice items used Yes/No, Never/Sometimes/Always/Not applicable, or Done/Not done response formats, as appropriate.

Data collection procedure

The study objectives and participation requirements were explained to eligible healthcare workers. Consenting participants completed an electronic questionnaire through a secure link or QR code. The observation checklist was used to assess whether five core pain-management actions were performed: use of a pain-assessment tool, assessment before and after analgesia, documentation of findings and actions, counselling caregivers on combined approaches, and provision of multimodal pain relief.

Data quality control

The questionnaire was configured to require responses to key items and to limit duplicate submissions. Completed records were reviewed for completeness, internal consistency, out-of-range values and logical errors. Variable labels, response codes and scoring directions were checked against the questionnaire before analysis. Negatively worded attitude items were identified in advance and reverse-scored. No pretest or pilot study was performed.

Data analysis

Data were downloaded from Google Forms, cleaned and coded in Microsoft Excel, and analysed using IBM SPSS Statistics. Categorical variables were summarised using frequencies and percentages. Continuous and composite scores were described using means and standard deviations (SDs), together with medians and interquartile ranges (IQRs) where appropriate.

The factual knowledge score comprised 21 items. Each correct response was scored 1, while an incorrect or Don't know response was scored 0, giving a possible score of 0–21. For the 12 procedural pain items, responses were coded 0 for not painful, 1 for painful and 2 for extremely painful to calculate item means and SDs; correct classification of each procedure was additionally scored 1, giving an overall pain-perception score of 0–12. The attitude domain contained 18 five-point Likert items scored from 1 to 5. Negatively worded statements were

reverse-scored before summation, producing a possible attitude score of 18–90. Favourable responses were defined as agree/strongly agree for positively worded statements and disagree/strongly disagree for negatively worded statements.

The self-reported practice score comprised 18 dichotomous items scored Yes = 1 and No = 0 (range 0–18). The observed-practice score comprised five checklist items scored Done = 1 and Not done = 0 (range 0–5). For procedure-specific analgesia, Never, Sometimes and Always were coded 0, 1 and 2, respectively; Not applicable responses were excluded from the denominator for that procedure. “Ever analgesia” was defined as Sometimes or Always. Multiple responses were permitted for barriers to analgesia and were therefore reported independently.

For descriptive classification, participants scoring at or above the sample mean for a domain were distinguished from those scoring below the mean; these were sample-relative categories and not validated clinical cut-offs. Domain scores were compared across age group, sex, professional cadre, duration of SCBU experience, training and guideline/protocol availability. The Mann–Whitney U test was used for two-group comparisons and the Kruskal–Wallis test for variables with more than two groups because of the small and unequal subgroup sizes. Significant omnibus comparisons were followed by pairwise Mann–Whitney U tests with Holm adjustment for multiple comparisons. All tests were two-sided and statistical significance was set at $p < 0.05$.

Ethical considerations

Ethical approval

was obtained from the Health Research Ethics Committee of the hospital. Participation was voluntary, electronic informed consent was obtained before questionnaire completion, and responses were handled confidentially. No personal identifiers were included in the analysis.

Results

Participant characteristics and organisational capacity

The mean age of respondents was 35.5 ± 8.3 years, with females accounting for 26 (52.0). Residents formed the largest professional group (23; 46.0%), followed by nurses/midwives (17; 34.0%), and 22 (44.0%) had over 24 months of SCBU experience (Table 1). Pain relievers were the most commonly reported resource (26; 52.0%). However, neonatal pain training and organisational support were limited: protocols/guidelines and leadership support were each reported by 13 (26.0%), and standardised pain scales and pain-management policies by 9 (18.0%) respondents (Fig. 1).

Table 1
Sociodemographic and professional characteristics of respondents

Variable	Category	n (%) / summary
Age (years)	Mean $\pm$ SD	35.5 $\pm$ 8.3
Age group	$\leq$ 30 years	14 (28.0)
	31–40 years	25 (50.0)
	> 40 years	11 (22.0)
Sex	Female	26 (52.0)
	Male	24 (48.0)
Professional cadre	Paediatric consultant	6 (12.0)
	Residents	23 (46.0)
	Paediatric surgeon	4 (8.0)
	Nurse/midwife	17 (34.0)
SCBU experience	< 6 mths	18 (36.0)
	6–12 mths	6 (12.0)
	12–24 mths	4 (8.0)
	> 24 mths	22 (44.0)

Knowledge of neonatal pain

The mean factual knowledge score was 11.14 ± 3.75 out of 21 (53.0%). Knowledge was highest for increased heart rate (0.86), foot and leg movements (0.84), and hand and arm movements (0.78) as pain indicators. The lowest scores concerned recognising non-pain markers (0.10), pain-pathway development (0.14), and the misconception that neonates readily become addicted to narcotic analgesics 0.24) as shown in (Table 2).

Table 2
Correct responses to factual neonatal pain knowledge items

Domain	Knowledge item	Yes n (%)	No n (%)	Don't know n (%)	Correct answer	Correct n (%)	Mean $\pm$ SD
Core knowledge	Premature infants at 28 weeks can appreciate pain	38 (76.0)	4 (8.0)	8 (16.0)	Yes	38 (76.0)	0.76 $\pm$ 0.43
Core knowledge	Development in pain pathways is not complete until 1 year of age	7 (14.0)	32 (64.0)	11 (22.0)	Yes	7 (14.0)	0.14 $\pm$ 0.35
Core knowledge	Paracetamol is a useful pain reliever in the neonatal period	35 (70.0)	9 (18.0)	6 (12.0)	Yes	35 (70.0)	0.70 $\pm$ 0.46
Core knowledge	Ibuprofen is not approved for use in neonates for pain relief	27 (54.0)	13 (26.0)	10 (20.0)	Yes	27 (54.0)	0.54 $\pm$ 0.50
Core knowledge	A neonate having moderate to severe pain can receive opioid analgesics	23 (46.0)	16 (32.0)	11 (22.0)	Yes	23 (46.0)	0.46 $\pm$ 0.50
Core knowledge	Neonates can easily become addicted to narcotic analgesics	14 (28.0)	12 (24.0)	24 (48.0)	No	12 (24.0)	0.24 $\pm$ 0.43
Core knowledge	Non-nutritive sucking can be used as analgesia in neonates	28 (56.0)	8 (16.0)	14 (28.0)	Yes	28 (56.0)	0.56 $\pm$ 0.50
Core knowledge	Sucrose can be used as a form of analgesia in neonates	20 (40.0)	10 (20.0)	20 (40.0)	Yes	20 (40.0)	0.40 $\pm$ 0.49
Core knowledge	Swaddling has a role in neonatal pain management	30 (60.0)	4 (8.0)	16 (32.0)	Yes	30 (60.0)	0.60 $\pm$ 0.49
Core knowledge	Lignocaine should never be used for pain relief in the neonate	10 (20.0)	18 (36.0)	22 (44.0)	No	18 (36.0)	0.36 $\pm$ 0.48
Pain markers	Furrowed brow	30 (60.0)	3 (6.0)	17 (34.0)	Yes	30 (60.0)	0.60 $\pm$ 0.49
Pain markers	Staring gaze	24 (48.0)	14 (28.0)	12 (24.0)	No	14 (28.0)	0.28 $\pm$ 0.45
Pain markers	Deepened nasolabial folds	34 (68.0)	6 (12.0)	10 (20.0)	Yes	34 (68.0)	0.68 $\pm$ 0.47
Pain markers	Tense cupped tongue	31 (62.0)	2 (4.0)	17 (34.0)	Yes	31 (62.0)	0.62 $\pm$ 0.49
Pain markers	Hand and arm movement	39 (78.0)	6 (12.0)	5 (10.0)	Yes	39 (78.0)	0.78 $\pm$ 0.42
Perception of procedural pain							

Domain	Knowledge item	Yes n (%)	No n (%)	Don't know n (%)	Correct answer	Correct n (%)	Mean $\pm$ SD
Pain markers	Foot and leg movements	42 (84.0)	5 (10.0)	3 (6.0)	Yes	42 (84.0)	0.84 $\pm$ 0.37
Pain markers	Jerking of the head	30 (60.0)	5 (10.0)	15 (30.0)	No	5 (10.0)	0.10 $\pm$ 0.30
Pain markers	Increased heart rate	43 (86.0)	1 (2.0)	6 (12.0)	Yes	43 (86.0)	0.86 $\pm$ 0.35
Pain markers	Drooling	17 (34.0)	10 (20.0)	23 (46.0)	No	10 (20.0)	0.20 $\pm$ 0.40
Pain markers	Increased blood pressure	33 (66.0)	2 (4.0)	15 (30.0)	Yes	33 (66.0)	0.66 $\pm$ 0.48
Pain markers	Sweating	38 (76.0)	3 (6.0)	9 (18.0)	Yes	38 (76.0)	0.76 $\pm$ 0.43
Perception of procedural pain							

Procedural pain perception was high, with a mean score of 10.40 ± 1.55 out of 12 (86.7%). Arteriovenous cutdown, circumcision and chest-tube insertion were perceived as most painful, whereas temperature measurement, phototherapy and radiography were rated least painful. Correct classification reached 96.0% for several invasive procedures but was lowest for nasogastric-tube insertion (60.0%), Table 3 below.

Table 3
Healthcare workers' perception of pain associated with neonatal procedures

Procedure	Not painful n (%)	Painful n (%)	Extremely painful n (%)	Correct classification %	Mean $\pm$ SD
Endotracheal intubation	12 (24.0)	30 (60.0)	8 (16.0)	76.0	0.92 $\pm$ 0.63
Tracheal suctioning	15 (30.0)	29 (58.0)	6 (12.0)	70.0	0.82 $\pm$ 0.63
Phototherapy	43 (86.0)	6 (12.0)	1 (2.0)	86.0	0.16 $\pm$ 0.42
Temperature check	47 (94.0)	2 (4.0)	1 (2.0)	94.0	0.08 $\pm$ 0.34
Circumcision	3 (6.0)	17 (34.0)	30 (60.0)	94.0	1.54 $\pm$ 0.61
Radiograph	45 (90.0)	2 (4.0)	3 (6.0)	90.0	0.16 $\pm$ 0.51
Arteriovenous cutdown	2 (4.0)	18 (36.0)	30 (60.0)	96.0	1.56 $\pm$ 0.58
Lumbar puncture	2 (4.0)	24 (48.0)	24 (48.0)	96.0	1.44 $\pm$ 0.58
Heel stick	7 (14.0)	32 (64.0)	11 (22.0)	86.0	1.08 $\pm$ 0.60
Venepuncture	2 (4.0)	36 (72.0)	12 (24.0)	96.0	1.20 $\pm$ 0.49
Nasogastric tube insertion	20 (40.0)	23 (46.0)	7 (14.0)	60.0	0.74 $\pm$ 0.69
Chest tube insertion	2 (4.0)	20 (40.0)	28 (56.0)	96.0	1.52 $\pm$ 0.58
Attitudes toward neonatal pain management					

The overall attitude score was high (73.90 ± 8.56 ; 82.1%), although only 30 respondents (60.0%) scored at or above the sample mean. Nearly all recognised the value of pain control for parental satisfaction, and most supported neonates' right to appropriate pain care. Less favourable responses concerned parental presence during painful procedures (12/50, 24.0%) and whether neonates experience pain comparable to adults (23/50, 46.0%) (Table 4).

Table 4
Distribution of responses to neonatal pain-management attitude statements

Attitude statement	SA n (%)	A n (%)	N n (%)	D n (%)	SD n (%)	Favourable n (%)	Mean ± SD
Neonates and children experience pain equal to that experienced by adults	15 (30.0)	8 (16.0)	13 (26.0)	11 (22.0)	3 (6.0)	23 (46.0)	3.42 ± 1.30
Parents should not be present during painful procedures†	10 (20.0)	15 (30.0)	13 (26.0)	12 (24.0)	0 (0.0)	12 (24.0)	2.54 ± 1.07
Pain management and pain relief are of priority in neonates' treatment	29 (58.0)	16 (32.0)	4 (8.0)	1 (2.0)	0 (0.0)	45 (90.0)	4.46 ± 0.73
Neonates have the right to appropriate assessment and management of their pain	38 (76.0)	8 (16.0)	3 (6.0)	0 (0.0)	1 (2.0)	46 (92.0)	4.64 ± 0.78
The most accurate judge of the intensity of the neonate's pain is her/his primary nurse	20 (40.0)	11 (22.0)	14 (28.0)	4 (8.0)	1 (2.0)	31 (62.0)	3.90 ± 1.09
Full treatment of pain is a humanitarian issue	24 (48.0)	19 (38.0)	5 (10.0)	2 (4.0)	0 (0.0)	43 (86.0)	4.30 ± 0.81
To better assess neonate pain, the nurse can discuss with her/his parents	26 (52.0)	14 (28.0)	8 (16.0)	1 (2.0)	1 (2.0)	40 (80.0)	4.26 ± 0.94
Assessment and control of neonate pain led to improved parent satisfaction	39 (78.0)	10 (20.0)	1 (2.0)	0 (0.0)	0 (0.0)	49 (98.0)	4.76 ± 0.48
Failure to assess and manage the neonate's pain affects his body and mind in the long	23 (46.0)	14 (28.0)	10 (20.0)	2 (4.0)	1 (2.0)	37 (74.0)	4.12 ± 1.00
The nurse's physical and mental fatigue can affect neonate pain relief	22 (44.0)	15 (30.0)	10 (20.0)	0 (0.0)	3 (6.0)	37 (74.0)	4.06 ± 1.10
Like other vital signs, pain scores should be documented	31 (62.0)	11 (22.0)	7 (14.0)	0 (0.0)	1 (2.0)	42 (84.0)	4.42 ± 0.88
To ensure patient's comfort, pain relief is one of the most important tasks of nurses	31 (62.0)	11 (22.0)	6 (12.0)	2 (4.0)	0 (0.0)	42 (84.0)	4.42 ± 0.86
Communicating with and educating neonate's parents play an effective role in relieving pain	31 (62.0)	10 (20.0)	6 (12.0)	3 (6.0)	0 (0.0)	41 (82.0)	4.38 ± 0.92
Available tools for measurement of pain are the best for determining pain severity in neonate	19 (38.0)	21 (42.0)	8 (16.0)	2 (4.0)	0 (0.0)	40 (80.0)	4.14 ± 0.83
When the necessary procedures have been done for the patient, the persistence of pain does not cause problems†	7 (14.0)	8 (16.0)	12 (24.0)	12 (24.0)	11 (22.0)	23 (46.0)	3.24 ± 1.35

Attitude statement	SA n (%)	A n (%)	N n (%)	D n (%)	SD n (%)	Favourable n (%)	Mean ± SD
Using pain assessment tools for determining neonate's pain led to an appropriate method of pain relief	27 (54.0)	15 (30.0)	6 (12.0)	2 (4.0)	0 (0.0)	42 (84.0)	4.34 ± 0.85
Measurement and control of neonate's pain can affect the healing process and reduces the hospital stay	25 (50.0)	13 (26.0)	8 (16.0)	2 (4.0)	2 (4.0)	38 (76.0)	4.14 ± 1.09
Evaluation and measurement of neonate's pain should be considered as one of the vital signs when examining the neonate	28 (56.0)	14 (28.0)	6 (12.0)	2 (4.0)	0 (0.0)	42 (84.0)	4.36 ± 0.85

Neonatal pain-management practices and barriers

Most respondents assessed neonatal pain using crying (94.0%), body movement or agitation (92.0%) and facial expression (82.0%), while 86.0% used breastfeeding for pain relief. Standardised assessment and pharmacological practices were uncommon: 32.0% used pain scales, and only 20.0% recorded pain scores or administered opioids before painful procedures (Table 5A). Analgesia was reportedly used for major invasive procedures, including circumcision (88.6%), chest-tube insertion (82.6%) and arteriovenous cutdown (78.3%). However, its use was limited for several routine procedures, particularly radiography (15.9%), phototherapy (29.8%) and temperature measurement (31.9%) (Table 5B). Although pain assessment before and after analgesia (60.0%) and caregiver counselling (62.0%) were relatively common, fewer respondents offered multimodal analgesia (48.0%), documented pain care (38.0%) or used a standard assessment tool (26.0%) (Fig. 2). Analgesia was mainly withheld because it was not routinely prescribed (64.0%), procedures were considered brief (40.0%) or medications were unavailable (38.0%) (Fig. 3).

Table 5
A. Self-reported neonatal pain-management practices

Practice item	Yes n (%)	No n (%)	Mean $\pm$ SD
I assess newborn's pain through crying	47 (94.0)	3 (6.0)	0.94 $\pm$ 0.24
I assess newborn's pain through facial expressions	41 (82.0)	9 (18.0)	0.82 $\pm$ 0.39
I assess newborn's pain through body movement and agitation	46 (92.0)	4 (8.0)	0.92 $\pm$ 0.27
I assess newborn's pain through the vital sign	32 (64.0)	18 (36.0)	0.64 $\pm$ 0.48
I use scales to assess pain in newborns	16 (32.0)	34 (68.0)	0.32 $\pm$ 0.47
I record newborns' pain scores on their medical chart	10 (20.0)	40 (80.0)	0.20 $\pm$ 0.40
I use non-nutritive suckling to relieve pain in newborns	24 (48.0)	26 (52.0)	0.48 $\pm$ 0.50
I encourage breastfeeding to relieve the pain in newborns	43 (86.0)	7 (14.0)	0.86 $\pm$ 0.35
I encourage skin-to-skin contact to relieve the pain in newborns	38 (76.0)	12 (24.0)	0.76 $\pm$ 0.43
I offer oral glucose or sucrose to relieve newborn pain prior to painful procedures	25 (50.0)	25 (50.0)	0.50 $\pm$ 0.51
I offer opioids to relieve newborn pain prior to painful procedures	10 (20.0)	40 (80.0)	0.20 $\pm$ 0.40
I position the newborn to relieve their pain	37 (74.0)	13 (26.0)	0.74 $\pm$ 0.44
I perform facilitated tucking in newborns during painful procedures	22 (44.0)	28 (56.0)	0.44 $\pm$ 0.50
I read the pain management guideline	23 (46.0)	27 (54.0)	0.46 $\pm$ 0.50
I use more than one non-pharmacological measurement to relieve the pain of newborns	27 (54.0)	23 (46.0)	0.54 $\pm$ 0.50
I use pharmacological and non-pharmacological combined to relieve pain in newborns	39 (78.0)	11 (22.0)	0.78 $\pm$ 0.42
I avoid using the IM route in the administration of pain relievers	32 (64.0)	18 (36.0)	0.64 $\pm$ 0.48
I advise the mothers of the newborns to use non-pharmacological techniques along with pain medications	38 (76.0)	12 (24.0)	0.76 $\pm$ 0.43

Table 5
B. Reported use of analgesia for neonatal procedures

Procedure	Never n (%)	Sometimes n (%)	Always n (%)	Not applicable n (%)	Ever analgesia n (%)*	Mean $\pm$ SD
Endotracheal intubation	21 (42.0)	14 (28.0)	10 (20.0)	5 (10.0)	24 (53.3)	0.76 $\pm$ 0.80
Tracheal suctioning	26 (52.0)	14 (28.0)	5 (10.0)	5 (10.0)	19 (42.2)	0.53 $\pm$ 0.69
Phototherapy	33 (66.0)	11 (22.0)	3 (6.0)	3 (6.0)	14 (29.8)	0.36 $\pm$ 0.61
Temperature check	32 (64.0)	6 (12.0)	9 (18.0)	3 (6.0)	15 (31.9)	0.51 $\pm$ 0.80
Circumcision	5 (10.0)	12 (24.0)	27 (54.0)	6 (12.0)	39 (88.6)	1.50 $\pm$ 0.70
Radiograph	37 (74.0)	7 (14.0)	0 (0.0)	6 (12.0)	7 (15.9)	0.16 $\pm$ 0.37
Arteriovenous cutdown	10 (20.0)	9 (18.0)	27 (54.0)	4 (8.0)	36 (78.3)	1.37 $\pm$ 0.83
Lumbar puncture	18 (36.0)	16 (32.0)	13 (26.0)	3 (6.0)	29 (61.7)	0.89 $\pm$ 0.81
Heel stick	27 (54.0)	16 (32.0)	4 (8.0)	3 (6.0)	20 (42.6)	0.51 $\pm$ 0.66
Venepuncture	28 (56.0)	9 (18.0)	9 (18.0)	4 (8.0)	18 (39.1)	0.59 $\pm$ 0.80
Nasogastric tube insertion	32 (64.0)	10 (20.0)	7 (14.0)	1 (2.0)	17 (34.7)	0.49 $\pm$ 0.74
Chest tube insertion	8 (16.0)	13 (26.0)	25 (50.0)	4 (8.0)	38 (82.6)	1.37 $\pm$ 0.77

Summary scores and exploratory associations

Pain perception had the highest proportional mean (86.7%), followed by attitude (82.1%), self-reported practice (61.1%), knowledge (53.0%) and observed practice (46.8%); 48.0–60.0% scored at or above the respective domain means (Table 6A). Knowledge differed significantly by professional cadre ($p = 0.004$), with nurses/midwives scoring lower than residents and paediatric consultants. Although pain perception varied by SCBU experience ($p = 0.041$), no pairwise difference remained significant after correction. Training showed a non-significant association with favourable attitude (AOR 3.62; $p = 0.084$), while guideline availability was non-significantly associated with good self-reported practice (AOR 3.25; $p = 0.153$).

Table 6
A. Summary of knowledge, perception, attitude and practice scores

Domain	Maximum	Mean $\pm$ SD	Median	IQR	Mean %	At/above mean n (%)
Factual knowledge	21	11.14 $\pm$ 3.75	11.0	9.0–14.0	53.0	24 (48.0)
Procedure pain perception	12	10.40 $\pm$ 1.55	11.0	9.0–12.0	86.7	27 (54.0)
Attitude	90	73.90 $\pm$ 8.56	75.0	70.0–79.8	82.1	30 (60.0)
Self-reported practice	18	11.00 $\pm$ 3.50	11.0	9.2–13.0	61.1	29 (58.0)
Observed practice	5	2.34 $\pm$ 1.67	2.0	1.0–4.0	46.8	24 (48.0)

Table 6

B. Sociodemographic, training /organisational factors associated with neonatal pain knowledge, perception, attitude and practice

Characteristic	Category	n	Knowledge median (IQR)*	Pain perception median (IQR)*	Attitude median (IQR)*	Self-reported practice median (IQR)*	Observed practice median (IQR)*
Age group	≤ 30 years	14	12.0 (8.2–14.0); H = 2.73, p = 0.255	10.0 (9.0–11.0); H = 3.17, p = 0.205	75.5 (72.2–77.8); H = 1.49, p = 0.474	10.0 (7.0–12.8); H = 2.24, p = 0.326	1.5 (1.0–2.8); H = 3.39, p = 0.184
	31–40 years	25	11.0 (9.0–13.0)	11.0 (10.0–12.0)	75.0 (70.0–78.0)	12.0 (10.0–14.0)	2.0 (2.0–3.0)
	> 40 years	11	13.0 (10.5–15.0)	11.0 (10.0–11.5)	80.0 (71.0–83.0)	11.0 (8.5–13.0)	4.0 (1.5–4.5)
Sex	Male	24	12.0 (10.0–14.2); U = 378.0, p = 0.201	11.0 (9.8–12.0); U = 369.5, p = 0.255	74.0 (67.0–78.0); U = 212.5, p = 0.054	11.0 (8.0–13.2); U = 271.5, p = 0.435	2.0 (0.0–4.0); U = 267.0, p = 0.379
	Female	26	10.5 (8.2–13.8)	10.5 (9.0–11.0)	76.5 (72.2–80.0)	11.5 (10.0–13.0)	3.0 (1.0–4.0)
Professional cadre	Resident	23	13.0 (11.0–14.0); H = 13.11, p = 0.004	10.0 (9.0–12.0); H = 2.75, p = 0.433	75.0 (68.5–79.0); H = 1.39, p = 0.709	11.0 (8.5–12.5); H = 2.58, p = 0.461	2.0 (0.5–3.0); H = 3.69, p = 0.297
	Paediatric consultant	6	14.0 (11.5–15.0)	11.5 (11.0–12.0)	79.0 (73.5–83.8)	10.0 (8.2–12.5)	2.5 (0.5–3.8)
	Paediatric surgeon	4	11.5 (10.2–12.8)	10.5 (9.8–11.2)	72.5 (68.2–77.0)	10.0 (8.5–12.5)	3.5 (2.2–4.2)
	Nurse/midwife	17	9.0 (6.0–10.0)	11.0 (9.0–11.0)	75.0 (72.0–78.0)	12.0 (10.0–15.0)	3.0 (2.0–4.0)
SCBU experience	< 6 mths	18	12.5 (9.2–14.0); H = 6.76, p = 0.080	10.0 (9.0–11.0); H = 8.27, p = 0.041	73.5 (69.2–78.8); H = 5.76, p = 0.124	11.5 (7.0–13.0); H = 1.15, p = 0.766	2.0 (0.2–4.0); H = 2.76, p = 0.430

Characteristic	Category	n	Knowledge median (IQR)*	Pain perception median (IQR)*	Attitude median (IQR)*	Self-reported practice median (IQR)*	Observed practice median (IQR)*
	6–12 mths	6	7.5 (5.2–10.5)	10.0 (10.0–10.8)	70.5 (67.8–74.0)	11.5 (10.2–13.5)	2.0 (1.2–2.0)
	12–24 mths	4	10.0 (9.5–10.5)	9.0 (7.5–10.2)	74.5 (71.8–76.5)	10.0 (9.8–10.5)	2.0 (1.8–2.8)
	> 24mths	22	12.0 (10.2–14.8)	11.5 (10.2–12.0)	77.0 (74.2–82.5)	11.0 (10.0–13.8)	3.0 (2.0–4.0)
Any training	Yes vs No	22	0.56 (0.15–2.04); p = 0.381	2.13 (0.55–8.25); p = 0.275	3.62 (0.84–15.59); p = 0.084	0.95 (0.26–3.54); p = 0.941	1.89 (0.52–6.86); p = 0.334
Guidelines/protocols	Yes vs No	13	0.51 (0.11–2.33); p = 0.388	0.42 (0.09–1.94); p = 0.269	0.52 (0.10–2.61); p = 0.427	3.25 (0.65–16.31); p = 0.153	1.49 (0.34–6.50); p = 0.593

Discussion

The respondents had a mean age of 35.5 ± 8.3 years, with females constituting a slight majority (52.0%). Residents, including house officers, formed the largest professional group (46.0%), followed by nurses/midwives (34.0%). This composition reflects the central role of these cadres in providing day-to-day care within the neonatal unit. The study identified a marked mismatch between recognising neonatal pain and its systematic clinical management. Pain perception (86.7%) and attitude (82.1%) were the strongest domains, while self-reported practice (61.1%), factual knowledge (53.0%) and observed practice (46.8%) were considerably lower. Healthcare workers therefore generally recognised painful procedures and supported neonatal pain management, but these strengths were not matched by adequate factual knowledge, standardised assessment, documentation or consistent analgesic practice.

Only a minority of respondents in our study had received neonatal pain training or had access to guidelines, pain scales and institutional policies, consistent with reports from several studies across Africa, Asia and South America.^{16,17,18,19,20,21,22,23} Adjusted analysis found no significant association between training or guideline availability and knowledge, perception, attitude or practice. However, training showed a positive but non-significant association with favourable attitudes, while guideline availability showed a similar association with good self-reported practice. These findings contrast with eastern Ethiopia, where training and protocols independently predicted good practice,²⁴ possibly because of our limited statistical power and differences in training quality or protocol implementation. Training should therefore be integrated into professional curricula, staff induction, bedside coaching and regular audit-and-feedback cycles. Each SCBU should also adopt an accessible, locally appropriate protocol specifying the pain-assessment tool, timing of assessment and recommended interventions for common procedures.

Respondents demonstrated moderate factual knowledge, scoring 11.14 out of 21 (53.0%). Although common pain indicators were recognised, gaps remained in neonatal pain neurophysiology, behavioural assessment and opioid safety. This pattern is consistent with reports from Nigeria, Kigali, North Shoa, the Philippines and Brazil,^{16,19,20,23,25} but contrasts with better knowledge in Addis Ababa and Malaysia.^{13,15} Differences may reflect variations in professional composition and assessment methods: the Addis Ababa study involved NICU nurses and the Malaysian study focused on paediatric doctors, whereas our sample included doctors, nurses and midwives with varying neonatal experience and training. Furthermore, our use of specific factual questions may have provided a more demanding assessment than broader measures of awareness. Professional cadre was significantly associated with factual knowledge. Nurses/midwives had lower median knowledge scores than residents and paediatric consultants. This may reflect differences in pre-service curricula, pharmacology teaching, prescribing responsibilities and access to continuing education. Similar professional gradients have been reported in North Shoa, Malaysia and Jamaica.^{13,20,22} Nevertheless, the misconception that neonates readily become addicted to opioids is particularly concerning because it may discourage appropriate analgesia. Multidisciplinary training should therefore strengthen neonatal pain neurobiology and behavioural assessment, distinguish tolerance and physical dependence from addiction, and provide practical guidance on analgesic indications, dosing and monitoring.

Pain perception was the strongest domain, with respondents correctly recognising most invasive procedures as painful. This finding was better than that of an earlier Nigerian multicentre survey¹⁶ and comparable to results from Malaysia.¹³ The difference may reflect the tertiary setting of our study, greater exposure to critically ill neonates or increased professional awareness over time (as SCBU experience was associated with pain perception in our case). Nevertheless, the poor recognition of pain associated with nasogastric-tube insertion suggests that frequently performed procedures may be perceived as harmless because they are brief or routine. As such standardised pain assessment and procedure-specific analgesic guidance are therefore needed to reduce the undertreatment of such procedures.^{26,27} The high attitude score indicates strong support for neonatal pain assessment and management, consistent with reports from Nigeria and Addis Ababa^{16,15} Attitude was unrelated to sociodemographic or professional characteristics, although training showed a positive but non-significant association. This suggests that favourable attitudes were broadly shared across the workforce and that the principal challenge is translating them into practice rather than persuading healthcare workers that neonatal pain matters. However, respondents were less supportive of parental presence during painful procedures, possibly because of concerns about parental distress, interference or negative perceptions of care. Since parents can provide effective comfort through breastfeeding, skin-to-skin contact, touch and maternal voice, they should be prepared and involved whenever clinically appropriate.^{28,29}

Respondents commonly assessed pain using crying, agitation, movement and facial expression and frequently used breastfeeding for pain relief. These low-cost practices are supported by evidence;^{28,29,30} however, reliance on behavioural signs alone may lead to under-recognition in critically ill, preterm or sedated neonates. Self-reported standardised assessment and documentation were poor: only 32.0% used a pain scale and 20.0% recorded pain scores, consistent with reports from the Philippines and Malaysia.^{13,23} Analgesia use reflected perceived procedural severity, with major procedures more frequently treated, while brief procedures such as venepuncture and nasogastric-tube insertion were often overlooked. This gap between pain recognition and treatment is consistent with findings from Jamaica and the EIPPAIN study^{11,22} These shortcomings were also evident in observed practice, which had the lowest proportional score (46.8%). Although pain was assessed before and after

analgesia in 60.0% of observations, a pain-assessment tool was used in only 26.0%, pain-related findings and actions were documented in 38.0%, and multimodal analgesia was provided in fewer than half. The differences between self-reported and observed practices may partly reflect recall or social-desirability bias but also indicate that recognition and favourable attitudes do not consistently translate into routine care. No significant associations were found between observed practice and age, sex, professional cadre, SCBU experience, training or guideline availability. Notably, professional cadre influenced knowledge but not observed practice, suggesting that superior factual knowledge alone may not overcome barriers such as absent protocols, limited prescribing, inadequate documentation and poor medication access. Education alone is therefore insufficient; effective implementation requires validated pain scales, procedure-specific treatment bundles, accessible protocols, reliable medication availability, supportive supervision and regular clinical audit.

Taken together, our findings support a unit-wide neonatal pain-improvement package rather than an education-only intervention. This should combine a validated pain scale, procedure-specific analgesia protocols, routine documentation and reassessment, accessible analgesics, evidence-based non-pharmacological measures and parental involvement. A multidisciplinary team should oversee implementation through supportive supervision and regular audit-and-feedback cycles.

Conclusion

The study identified a persistent gap between recognising neonatal pain and providing reliable relief. Although attitudes and procedural pain perception were favourable, factual knowledge, standardised assessment, documentation and analgesic practice were inadequate. A systems-based response combining education, validated pain scales, procedure-specific treatment bundles, accessible analgesics, parental participation and continuous audit is more likely than training alone to improve routine neonatal pain care.

Limitation

This study was limited by its single-centre design and small sample, which reduced generalisability and precision, particularly for subgroup and regression analyses. Self-reported practices may have been affected by recall and social-desirability bias.

Declarations

Ethical approval and consent to participate

Written informed consent was obtained from the parents of patient.

Consent for publication

Written informed consent to publish the case was obtained from the parents.

Conflict of interest statement

The authors affirm that they have no competing financial interests or personal relationships that could have influenced the work reported in this paper

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Author Contribution

SSM- Conceived of the study, contributed to literature search and drafted the manuscript
AZM- Conceived of the study, did the literature search, reviewed analyzed data and reviewed the manuscript.
KS- Conceived of the study, supervised data collection, cleaned data, and reviewed the manuscript
SAM- Conceived of the study, did the data analysis, and co-drafted the manuscript

Availability of data and materials

The data that support the findings are available on request from the corresponding author.

Code Availability

Not applicable.

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Figures

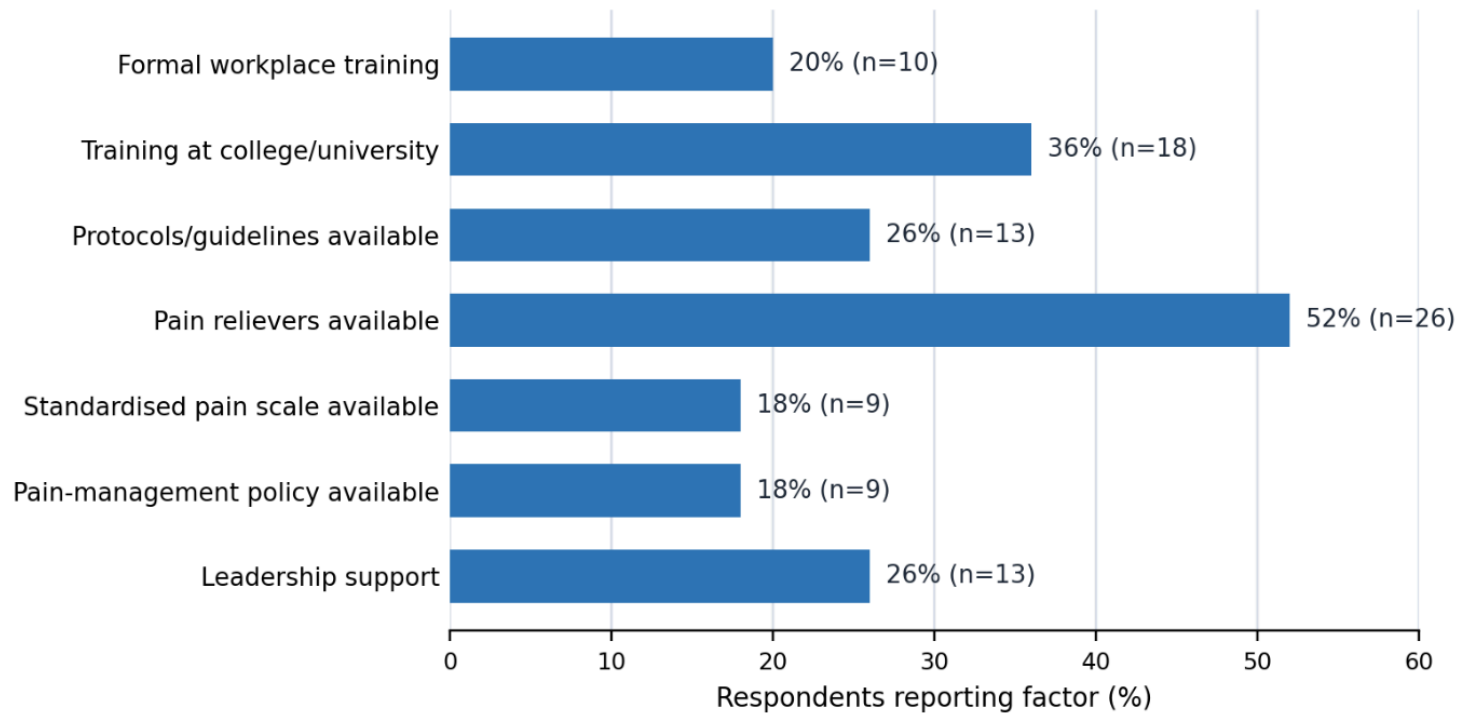


Figure 1

Organisational factors related to neonatal pain management

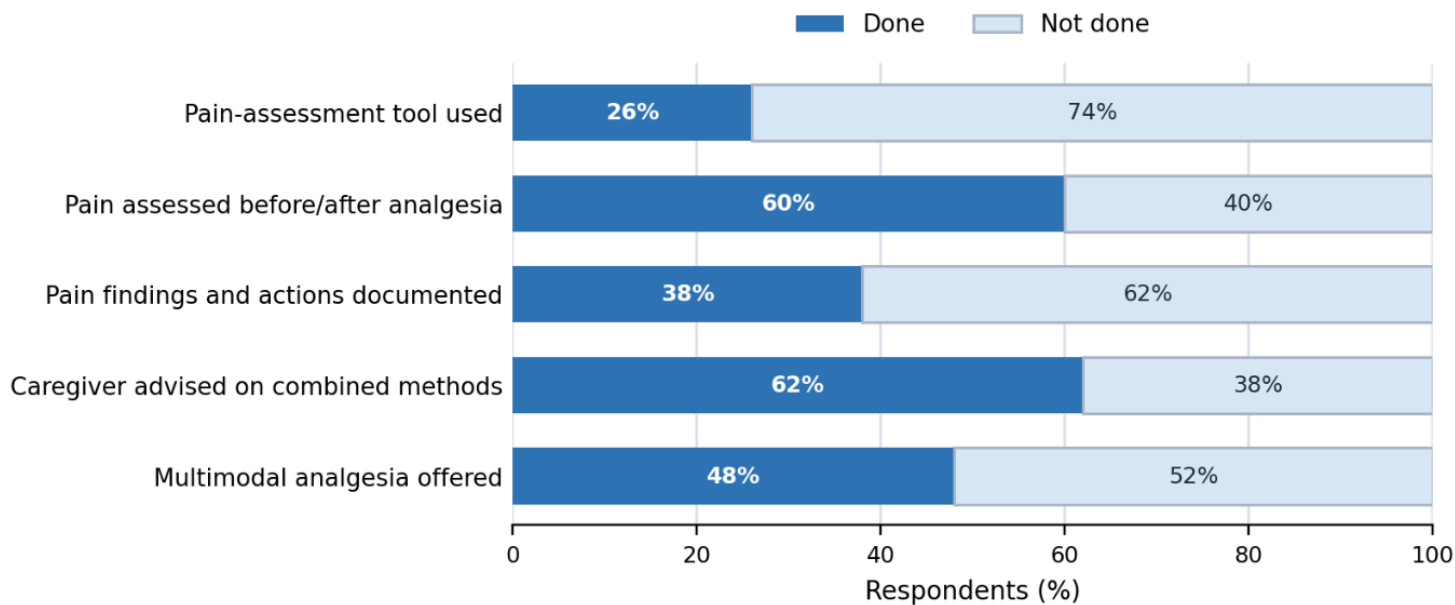


Figure 2

Observed neonatal pain-management practices

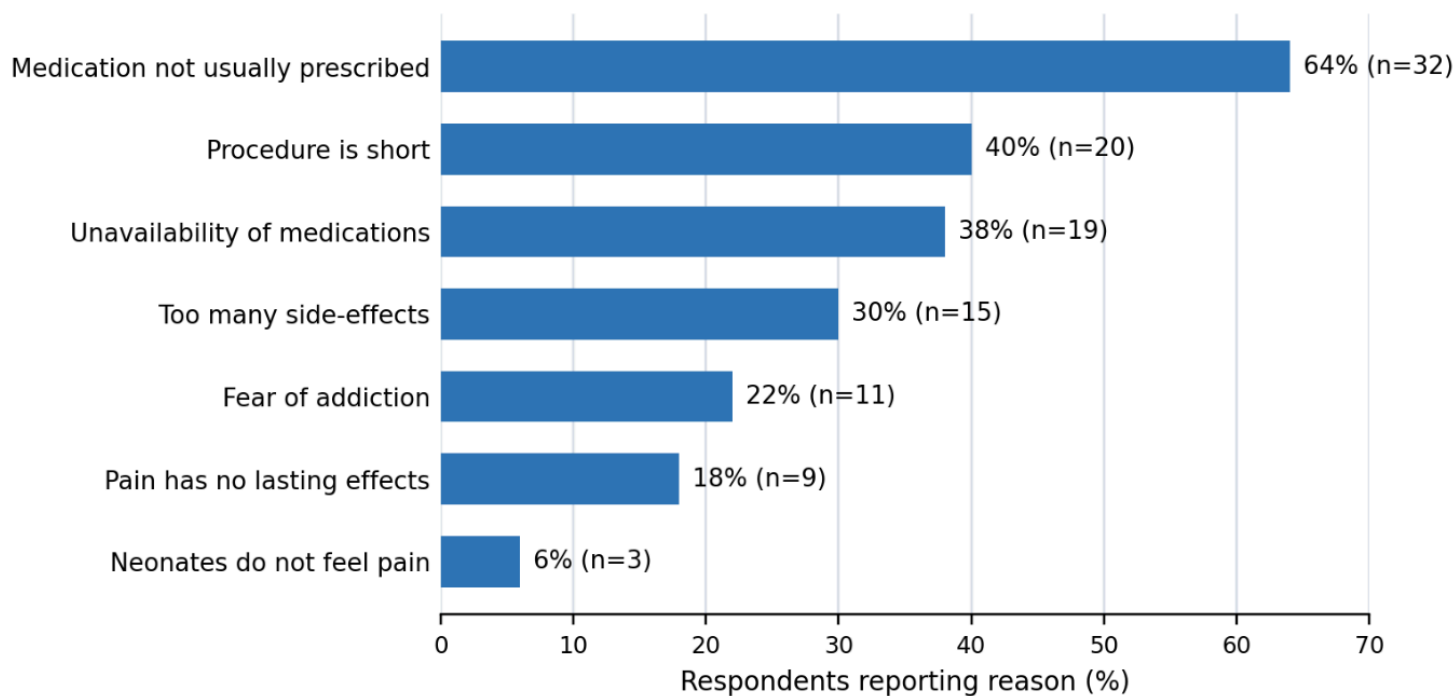


Figure 3

Reported reasons for not administering neonatal pain relief