

Pain Assessment and Management in Neonatal Intensive Care Units in the Eastern Province of Saudi Arabia: A Survey of Doctors and Nurses

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Abstract

Background: Despite its importance, no study from the Middle East has assessed the neonatal pain knowledge of health-care providers in neonatal intensive care units (NICUs).

Objectives: To evaluate the knowledge and attitudes of pediatricians and nurses in Saudi Arabia toward procedural pain assessment and its management in neonates.

Materials and Methods: This questionnaire-based, cross-sectional study was conducted between March and June 2015 at three NICUs in the Eastern Province of Saudi Arabia, namely, King Fahd Hospital of the University, Al Khobar; Security Forces Hospital, Dammam; and King Fahd Medical Military Complex, Dhahran. All pediatricians/neonatologists and nurses in these units were included, and a previously validated questionnaire was distributed and collected by an assigned clinician. The questionnaire elicited pain-related knowledge of seven procedures using a 10-point Likert scale.

Results: A total of 150 questionnaires were distributed, from which 107 complete responses were obtained (nurses: 81 [75.7%]; doctors: 26 [24.3%]). The overall knowledge scores were high (mean \pm standard deviation = $77.3\% \pm 11.6\%$). The mean pain rankings of doctors (7.2) were higher than those of nurses (6.5) for all procedures. Nurses reported more frequent use of analgesia than doctors (15.4% vs. 11.5%). Doctors often did not use comfort measures for any procedures, except during procedures on term to 28-day-old neonates. The use of pain tools was reported by only 12 (11%) clinicians.

Conclusion: This study found that despite adequate knowledge about pain perception by neonates, the use of analgesia for procedural pain relief is low among doctors in the NICUs of the Eastern Province of Saudi Arabia. In addition, there is underutilization of pain assessment tools, thereby indicating the need to address this knowledge–practice gap.

Keywords: Analgesia, intensive care units, neonate, pain, Saudi Arabia, sucrose

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INTRODUCTION

Pain remains underestimated and inappropriately managed in neonates.^[1] Theoretically, by late gestation, a fetus develops the anatomic, neurophysiological and hormonal components required for perceiving pain. In fact, responses to pain in preterm and term infants have been shown to be comparable, or even exaggerated, to those reported in older children and adults.^[2]

Technical advances in neonatal critical areas have improved the survival of very low birth weight and extremely premature infants, but such population is frequently subjected to painful invasive procedures during their stay at the critical care units.^[3,4] It should be noted that experiencing repeated painful stimuli early in life has been linked to short- and long-term complications^[5,6] such as physiologic unsteadiness, disturbed neurodevelopment, abnormal somatosensory and stress response systems, which can continue into late childhood.^[5-7] This highlights the need for preventing pain in neonates beyond an ethical requirement.

Despite the recommendations from the American Academy of Pediatrics (AAP), neonatal pain continues to be inappropriately assessed, ineffectively recognized and suboptimally managed.^[1,3,8] Despite its importance, to the best of our understanding, no study from the Middle East has assessed the neonatal pain knowledge of health-care providers in neonatal intensive care units (NICUs). To fill this gap in the literature, the aim of this study is to evaluate the knowledge and attitude of pediatricians and nurses in the neonatal care units in the Eastern Province of Saudi Arabia toward procedural pain and its management in neonates.

MATERIALS AND METHODS

This questionnaire-based, descriptive, cross-sectional study was conducted between March and June 2015 at three Level 3 classified^[9] government NICUs in the Eastern Province of Saudi Arabia, namely King Fahd Hospital of the University, Al Khobar; Security Forces Hospital, Dammam; and King Fahd Medical Military Complex, Dhahran, which represent the biggest NICU centers in the Eastern Province of the total five NICUs. All the NICU pediatricians/neonatologists and nurses were included, but the heads of the units were excluded. The questionnaire was presented and explained by the authors during previously arranged staff meetings. Later, one of the authors personally distributed and collected the questionnaire from all eligible doctors and nurses at

the three NICUs. Written consent was obtained from all participants as part of the questionnaire. Participants were informed of participation being voluntary and that no financial incentives would be provided. In addition, the authors ensured the anonymity of the participants by seeking minimal demographic data and by stating that the information collected would only be used for this study. A response was considered complete if >90% of the questionnaire had been completed.

The study used a 25-item, multiple-choice questionnaire used by Akuma and Jordan^[10] (after official communication and approval); the questionnaire was originally developed from previous work.^[11] The questionnaire elicited pain-related knowledge of seven procedures (heel prick, venipuncture, lumbar puncture, elective endotracheal intubation, arterial cannulation/stab, long line insertion and chest drain) in four gestational age categories (<28 weeks' gestation, 28–36 weeks' gestation, 37 weeks' gestation to term and term to 28 days postnatally). The internal consistency of the questionnaire using the Cronbach's alpha was 0.949 (range: 0.911–0.977).

The questions were scored using a Likert scale (0 = no pain and 10 = worst pain) or categories (less than/same/more than or never/rarely/often/always). For pain relief interventions, the use of analgesia was defined as pharmacological intervention, while nonpharmacological interventions were comfort measures such as maternal breastfeeding or bottle-feeding, use of pacifier, cuddling/swaddling, holding the baby and massaging of the procedure site. Knowledge was scored in comparison to referenced model answers.

Data were analyzed using SPSS version 18 (SPSS Inc., Chicago, IL, USA). The rating of pain perception by a Likert scale was treated as ordinal data. Results of reported practices were analyzed as categorical variables. Interprofessional differences in reported practices were explored with chi-square test for linear-by-linear association, with one degree of freedom. Analyses of the two extreme neonatal ages (i.e., <28 weeks' gestation and term to 28 days) were chosen because there were few variances across the age categories. $P \leq 0.05$ was considered statistically significant.

This study was retrospectively approved by the Institutional Review Board of Imam Abdulrahman Bin Faisal University (no. 2018-11-321) on December 26, 2018. In addition, approval was also taken from the heads of NICUs at all three hospitals before conducting the survey.

RESULTS

A total of 150 questionnaires were distributed (45 doctors and 105 nurses), of which 115 responses were received (76.7%). However, 8 responses were excluded because of inadequate completion, and thus the final analysis was based on 107 responses: 81 (75.7%) from nurses and 26 (24.3%) from doctors. Most of the respondents were females (91; 85%).

For the knowledge section of the questionnaire, all the questions had been answered by all respondents, and the overall knowledge scores were high (mean \pm standard deviation [SD] = 77.3% \pm 11.6%). Notably, only 30.8% of the nurses had correct knowledge of response to pain being congenital, while both groups had relatively lower knowledge about analgesia dosing in neonates [Table 1].

All respondents recognized that neonates of >28 weeks' gestational age can perceive pain, while only 14 (13%) respondents had incorrect knowledge of <28 weeks' gestational age neonates not perceiving pain. Heel prick was reported as the least painful procedure (Likert scale mean \pm SD = 4.05 \pm 2.90) and chest tube insertion as the most painful (mean: 8.58, SD: 1.97). The mean pain rankings of doctors (7.2% \pm 2.25%) were higher than those of

nurses (6.5% \pm 2.5%) for all procedures. For comparison between the intensity of infant versus adult procedural pain, 14 (54%) doctors and 45 (55.6%) nurses reported that infants feel "more pain" than adults, while 3 (11.5%) doctors and 6 (7.4%) nurses stated that infants feel "less pain."

With respect to current practices, analgesia was more likely to be reserved for more invasive procedures. In term to 28-day-old neonates, nurses reported more frequent use of analgesia than doctors except for elective intubation, arterial cannulation and chest tube insertion [Tables 2 and 3]. Regarding the reported use of comfort measures, an interprofessional discrepancy was observed among all procedures and gestations [Tables 4 and 5]. Doctors did not always use comfort measures for any procedure. For pain measurement, only 12 (11%) respondents stated using pain assessment tools, with most nurses (51, 63%) and doctors (16, 61.5%) stating unavailability of pain tools in their units. Sucrose was used for procedural pain relief by 9 (34.6%) doctors and 13 (16%) nurses. Few clinicians reported receiving training on neonatal pain and analgesia before their primary qualification (7.7% of doctors and 18.5% of nurses) [Table 6].

DISCUSSION

Neonatal pain is one of the most underestimated issues among health-care providers in NICUs worldwide.^[1,3,8]

Table 1: Responses to questions assessing knowledge

Questions	Model answer (Referenced)	True	False	Knowledge score (percentage correct)
Neonates do not experience pain	False ^[5]	2	105	98.1 Doctors=96.2 Nurses=98.8
Response to pain is entirely congenital	True ^[5]	46	61	43 Doctors=80.7 Nurses=30.8
Neonates experience lesser degree of pain to adults	False ^[2]	16	91	85 Doctors=73.1 Nurses=88.8
Analgesia is not critical to neonates because of lack of memory of experiences	False ^[12]	19	88	82.2 Doctors=80.8 Nurses=82
Physiological stress to pain can be more dangerous than analgesia side effects	True ^[5]	76	31	71 Doctors=76.9 Nurses=69.1
Analgesia is too dangerous to use in neonates	False ^[3]	23	84	78.5 Doctors=92.3 Nurses=74
Pain diminishes quicker in newborns than adults	False ^[13]	31	76	71 Doctors=80.7 Nurses=67.9
Neonates require less analgesia than adults in relation to body weight	False ^[14]	46	61	57 Doctors=65.4 Nurses=54.3
At 26 weeks, the neonate has all the apparatus needed to perceive pain	True ^[5]	95	12	89 Doctors=92.3 Nurses=87.5
Overall (%)				Doctors=82 Nurses=72.57

Table 2: Use of analgesia for procedures in neonates <28 weeks' gestation according to profession (n, %)

Procedure	Profession	Never	Rarely	Often	Always	χ^2*	P
Heel prick	Doctors	15 (57.7)	10 (38.5)	1 (3.8)	0	15.59	NA**
	Nurses	62 (76.5)	10 (12.3)	9 (11.1)	1 (3.8)		
Venipuncture	Doctors	12 (46.1)	6 (23)	7 (27)	1 (3.8)	13.01	<0.001
	Nurses	60 (74)	12 (14.8)	8 (9.8)	1 (1.2)		
Lumbar puncture	Doctors	11 (42.3)	6 (23)	8 (30.7)	1 (3.8)	14.49	<0.001
	Nurses	14 (17.3)	10 (12.3)	23 (28.4)	15 (18.5)		
Elective intubation	Doctors	2 (7.7)	5 (19.2)	10 (38.5)	9 (34.6)	8.99	0.003
	Nurses	5 (6.1)	6 (7.4)	36 (44.4)	34 (43)		
Arterial cannulation	Doctors	16 (61.5)	4 (15.4)	4 (15.4)	2 (7.7)	9.24	0.002
	Nurses	69 (88.5)	1 (1.3)	7 (8.6)	1 (1.3)		
Long line insertion	Doctors	8 (30.8)	7 (26.9)	8 (30.8)	3 (11.5)	20.14	<0.001
	Nurses	12 (14.8)	9 (11.1)	24 (29.6)	30 (37)		
Chest tube insertion	Doctors	5 (19.2)	1 (3.8)	9 (34.6)	11 (42.3)	7.86	0.004
	Nurses	25 (30.8)	8 (9.8)	12 (14.8)	34 (42)		

*Degree of freedom=1, linear-by-linear association, NA**; Chi-square not appropriate, as more than 20% cells have expected outcome <5 or 0 in at least 1 cell. NA – Not available

Table 3: Use of analgesia for procedures in neonates (term to 28 days) according to profession (n, %)

Procedure	Profession	Never	Rarely	Often	Always	χ^2*	P
Heel prick	Doctors	18 (69.2)	6 (23.1)	1 (3.8)	1 (3.8)	8.90	0.003
	Nurses	73 (91.3)	1 (1.2)	6 (7.4)	0 (0.0)		
Venipuncture	Doctors	19 (73.1)	2 (7.7)	5 (19.2)	0 (0.0)	20.14	<0.001
	Nurses	68 (83.9)	3 (3.7)	10 (12.3)	0 (0.0)		
Lumbar puncture	Doctors	18 (69.2)	1 (3.8)	7 (26.9)	0 (0.0)	7.86	0.004
	Nurses	59 (73.8)	7 (8.8)	13 (16)	1 (1.2)		
Elective intubation	Doctors	6 (23.1)	3 (11.5)	10 (38.5)	7 (26.9)	13.0	<0.001
	Nurses	26 (32.5)	8 (10.0)	41 (50.6)	5 (6.3)		
Arterial cannulation	Doctors	14 (53.8)	4 (15.4)	4 (15.4)	4 (15.3)	NA	NA
	Nurses	65 (81.3)	3 (3.7)	11 (13.6)	1 (1.2)		
Long line insertion	Doctors	12 (46.2)	4 (15.4)	5 (19.2)	5 (19.2)	13.0	<0.001
	Nurses	20 (24.7)	24 (30)	16 (19.7)	20 (24.7)		
Chest tube insertion	Doctors	3 (11.5)	1 (3.8)	11 (7.7)	11 (42.3)	7.86	0.004
	Nurses	11 (13.8)	11 (13.6)	43 (53)	15 (18.8)		

*Degree of freedom=1, linear-by-linear association, NA**; Chi-square not appropriate, as more than 20% cells have expected outcome <5 or 0 in at least 1 cell. NA – Not available

Table 4: Use of comfort measures for procedures in neonates <28 weeks' gestation according to profession (n, %)

Procedure	Profession	Never	Rarely	Often	Always	χ^2*	P
Heel prick	Doctors	18 (69.2)	1 (3.8)	7 (26.9)	0 (0.0)	9.75	0.002
	Nurses	46 (56.8)	3 (3.7)	12 (14.8)	18 (22.2)		
Venipuncture	Doctors	15 (57.7)	2 (7.6)	9 (34.6)	0 (0.0)	13.0	<0.001
	Nurses	33 (40.7)	13 (16)	17 (20.9)	16 (19.7)		
Lumbar puncture	Doctors	16 (61.5)	2 (7.7)	6 (23.1)	2 (7.7)	NA	NA
	Nurses	26 (32)	14 (17.3)	25 (30.8)	14 (17.3)		
Elective intubation	Doctors	18 (69.2)	0 (0.0)	4 (15.4)	4 (15.4)	13.0	<0.001
	Nurses	49 (60.5)	10 (12.3)	8 (9.9)	12 (14.8)		
Arterial cannulation	Doctors	17 (65.4)	2 (7.7)	7 (26.9)	0 (0.0)	NA	NA
	Nurses	22 (27.8)	22 (27.8)	18 (22.2)	17 (21.5)		
Long line insertion	Doctors	18 (69.2)	2 (7.7)	5 (19.2)	1 (3.8)	13.0	<0.001
	Nurses	30 (38)	16 (19.7)	16 (19.7)	17 (21.5)		
Chest tube insertion	Doctors	17 (65.4)	0 (0.0)	5 (19.2)	4 (15.4)	NA	NA
	Nurses	46 (58.2)	2 (2.5)	16 (19.7)	15 (19)		

*Degree of freedom=1, linear-by-linear association, NA**; Chi-square not appropriate, as more than 20% cells have expected outcome <5 or 0 in at least 1 cell. NA – Not available

Yet no study from the Middle East had previously assessed the knowledge of NICU health-care professionals regarding the same. The current study found that almost all doctors (96%) and nurses (92.5%) from the three main NICUs in the Eastern Province of Saudi Arabia have knowledge that neonates, irrespective of their gestational age, perceive pain. These findings are in line with those of similar studies from

the United Kingdom,^[10] the United States^[11] and Norway.^[15] This study evidently found interprofessional differences, with doctors ranking the pain intensity for all procedures higher than nurses. This is contrast to the findings of previous studies.^[10,15] This may be attributed to lack of awareness campaigns regarding the assessment and management of neonatal pain in these NICUs, which would reduce this gap.

Table 5: Use of comfort measures for procedures in neonates (term to 28 days) according to profession (n, %)

Procedure	Profession	Never	Rarely	Often	Always	χ^2*	P
Heel prick	Doctors	8 (30.8)	2 (7.7)	8 (30.8)	8 (30.8)	0.78	0.39
	Nurses	30 (37)	5 (6.1)	26 (32.5)	19 (23.8)		
Venipuncture	Doctors	6 (23)	3 (11.5)	9 (34.6)	8 (30.8)	3.26	0.03
	Nurses	15 (18.8)	12 (15)	28 (34.5)	25 (30.8)		
Lumbar puncture	Doctors	7 (26.9)	4 (15.4)	7 (26.9)	8 (30.8)	11.96	<0.001
	Nurses	14 (17.3)	3 (3.7)	45 (55.5)	18 (22.5)		
Elective intubation	Doctors	11 (42.3)	1 (3.8)	5 (19.2)	9 (34.6)	3.26	0.06
	Nurses	38 (46.9)	3 (3.7)	24 (29.6)	15 (18.5)		
Arterial cannulation	Doctors	10 (38.4)	5 (19.2)	4 (15.3)	7 (26.9)	13.25	<0.001
	Nurses	12 (14.8)	12 (14.8)	35 (43.2)	21 (25.9)		
Long line insertion	Doctors	9 (34.6)	4 (15.4)	6 (23.1)	7 (26.9)	15.44	<0.001
	Nurses	11 (13.6)	22 (27.1)	26 (32)	21 (25.9)		
Chest tube insertion	Doctors	10 (38.4)	2 (7.7)	4 (15.3)	10 (38.4)	9.96	0.002
	Nurses	29 (35.8)	9 (11.1)	23 (28.4)	19 (23.4)		

*Degree of freedom=1, linear-by-linear association

Table 6: Responses to questions relating to current clinical practice, governance and training

Questions	Profession	Responses		
		Yes, n (%)	No, n (%)	Don't know, n (%)
Does your unit have a pain assessment tool for use among neonates?	Doctors	3 (11.5)	16 (61.5)	7 (27)
	Nurses	30 (37)	51 (63)	0
Do you use sucrose in your unit?	Doctors	9 (34.6)	17 (65.4)	0
	Nurses	13 (16)	68 (84)	0
Do you have any concern using sucrose in a neonate?	Doctors	2 (7.7)	24 (92.3)	0
	Nurses	16 (19.7)	57 (70.3)	0
Are you concerned about over-medication in your unit during procedures?	Doctors	4 (15.4)	22 (84.6)	0
	Nurses	39 (48.2)	42 (51.8)	0
Are you concerned about undermedication in your unit during procedures?	Doctors	16 (61.5)	10 (38.5)	0
	Nurses	48 (59.3)	33 (40.7)	0
Did you receive training on neonatal pain and analgesia before your primary qualification?	Doctors	2 (7.7)	24 (92.3)	NA
	Nurses	15 (18.5)	66 (81.4)	0
Have you received training on neonatal pain and analgesia in your current post?	Doctors	5 (19.2)	21 (80.7)	NA
	Nurses	41 (50.6)	40 (49.4)	0
Does your unit have a neonatal pain management guideline?	Doctors	9 (34.6)	15 (57.7)	2 (7.7)
	Nurses	77 (95.1)	4 (4.9)	0
Has your unit's pain policy been audited in the past year (responses of clinicians who answered (yes) to question above)	Doctors (n=9)	2 (22.2)	1 (11.1)	6 (66.6)
	Nurses (n=77)	11 (14.3)	22 (28.6)	44 (57.2)

NA – Not available

Despite knowledge of neonatal pain, analgesia application for relief of procedural pain was found to be low, except during the more invasive procedures. The use of analgesia versus comfort measures was also found to vary depending on gestational age, with doctors using pain relief measures more often for term infants than preterm infants. This finding highlights the need for educating doctors to overcome the underestimation of neonatal pain in preterm infants. Our study findings are in agreement with those of a recent nationwide study of 103 NICUs in Italy, where the authors found that routine use of neonatal pain relief measures and compliance with best practices were suboptimal.^[16] Interestingly, this study found that although most respondents (81, 75.7%) had no about concern using sucrose as a procedural pain reliever, only a few (22, 20.5%) used it. This contrast between knowledge and practice suggests that health-care providers in these NICUs are less receptive toward adopting new medical methodologies despite its knowledge.

The inability of a neonate to report pain and the challenges of assessing pain in sick, extremely premature and neurologically affected neonates makes effective management of pain problematic.^[17] Therefore, pain assessment tools act as an alternative measure of physiologic and behavioral responses toward pain among such populations and have been recommended by AAP.^[3] However, it remains underutilized, as shown in the Italian study, where less than a quarter of the studied NICUs used pain scales.^[16] Similarly, the present study found that only a few respondents (12, 11%) reported using neonatal pain assessment tools, with only 3 (11.5%) doctors and 30 (37%) nurses acknowledging that their unit had a pain assessment tool, which is similar to the findings of studies from different countries.^[10,18]

The current study found that nurses are more adhering to their institutions' neonatal pain management guideline than doctors, which may be because, in general, nurses work in a

collective systematized work environment compared with doctors, who favor an individualistic approach.^[14]

A limitation of the current study is the relatively fewer doctors and an overall small sample size, which limits the generalizability of the findings to only the Eastern Province of Saudi Arabia. Therefore, the authors recommend further studies across the region and Saudi Arabia to provide a larger consensus. In addition, questionnaires are subjected to various degrees of bias based on social acceptance and individual desirability; nonetheless, the authors attempted to reduce the effects of such bias by collecting minimal personal information.

CONCLUSION

This study showed that doctors and nurses in the NICUs of hospitals in the Eastern Province of Saudi Arabia have adequate knowledge about pain perception by neonates, yet the use of analgesia for procedural pain relief is low, especially among doctors. In addition, there is underutilization of pain assessment tools and lack of guidelines adherence. The authors recommend strict orientation programs and prompt training to ensure compliance to pain assessment and management guidelines for minimizing neonatal procedural pain.

Ethical considerations

This study was retrospectively approved by the Institutional Review Board of Imam Abdulrahman Bin Faisal University (no. 2018-11-321) on December 26, 2018, and the department heads of all three NICUs provided permission before the study was conducted. The study was conducted in adherence with the guidelines of the Declaration of Helsinki, 2013. Written consent was obtained from all participants.

Peer review

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Conflicts of interest

There are no conflicts of interest.

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