Neonatal Admission and Its Relationship to Maternal Pain Scores and Analgesia

Alannah L. Cooper, BNurs (Hons), RN; Janie A. Brown, PhD, MEd, BN, RN; Suzanne Kelly, BSc Midwifery, RM; Siobhan P. Eccles, BSc Midwifery, RM; Richard Parsons, PhD, MSc; Rebecca Osseiran-Moisson, MPhil

ABSTRACT

The aim of this study was to determine whether postnatal women whose babies required neonatal intensive care unit (NICU) admission self-reported lower pain scores

and required less analgesia than women whose babies remained with them. A prospective matched audit comparing pain scores and analgesia requirements where every woman with a baby admitted to the NICU was matched to 2 women whose babies remained on the ward was under- taken. Matches were based on age, number of previous births, type of birth, episiotomy, and epidural or spinal analgesia use. Data were collected on pain scores and analgesia administered in the first 72 hours postbirth. A total of 150 women were recruited and matched from November 2015 to May 2017. No statistically significant differences were found between the 2 groups for opiate analgesia use (P .91) or pain scores (P .89). Regardless of NICU ad- mission, significantly higher pain scores were reported in participants who had episiotomies (P = .03). Birth via cesarean birth resulted in significantly higher pain scores (P < .01) and greater opiate administration (P < .01). This study found no statistically significant difference between pain scores or analgesia use of mothers whose babies required NICU admission and mothers whose babies remained with them.

Key Words: analgesia, birth, neonatal intensive care, pain, postpartum

Many women experience pain in the first days after giving birth. A national survey of 1573 women in the United States explored pain in the first 2 months after birth and found that 48% of women who had a vaginal birth reported perineal pain and 79% of women who had given birth via cesarean birth reported incisional pain.1 Effective pain management is essential to promote postpartum recovery and enable women to manage postnatal de- mands including caring for their baby, parent education, breastfeeding, and lactation.2 Postpartum pain management can include simple analgesia, opioids, anesthesia, ice packs, and complementary therapies.2–6 Multimodal analgesia is routinely administered to manage acute pain after birth, and effective early pain management may prevent chronic pain.7 With a heavy focus in the literature on pain during labor and birth, postpartum pain and the factors that may affect it are often over- looked. There is some evidence that early ambulation and exercise may reduce pain intensity for women who have had cesarean births.8

The potential negative psychological impact of a neonatal intensive care unit (NICU) admission on mothers is well known. Mothers of preterm babies admitted to the NICU experience higher levels of depression, anxiety, and fatigue than mothers with healthy full-term babies.9–13 These differences may, in part, be due to a stressful birth, interruption of psychological processes during pregnancy, concern for the well-being of their preterm baby, and NICU experiences.12,14,15 Mothers of preterm babies in the NICU have been found to experience guilt in relation to their pregnancy not reaching full term, anxiety and fear holding their babies in the NICU, and grief at seeing and hearing other mothers interact with their full-term babies.16 Exclusion has been found to be key to the experience of NICU mothers, with women reporting feeling they belonged neither to the postnatal

ward nor the NICU environment and that their babies belonged more to caregivers in the NICU than to themselves.17 In addition to anxiety, fear, and guilt, the separation caused by NICU admission is associated with loneliness and isolation for mothers.12,17

While research has been conducted into the potential psychological and emotional impact of NICU admission, it is not known whether NICU admission could also affect mothers physiologically. The midwives at the study hospital anecdotally reported that women whose babies were admitted to the NICU had less pain and required less analgesia than their counterparts whose babies remained on the postnatal ward. Women whose babies are admitted to the NICU tend to ambulate earlier to visit their babies and often report being distracted from nor- mal postnatal demands due to the stress of their baby's admission to the NICU. Upon searching the literature, no evidence was found to confirm or deny the anecdotal suggestion that NICU admission affects mothers' pain and analgesia usage. Therefore, a research study was undertaken to investigate whether any difference existed between the 2 groups with respect to these fac- tors. The aim of the study was to determine whether postnatal women whose babies were admitted to the NICU self-reported lower postpartum pain scores and required decreased administration of postbirth analgesia compared with women whose babies remained with them.

STUDY SITE

The study hospital has a level 2B NICU that admits babies born after 30 weeks and can accommodate up to 30 neonates. Late preterm neonates are admitted to the postnatal ward rather than to the NICU, unless the infant has a specific medical diagnosis or is under 35 weeks' gestation. The main reasons for the admission of a baby to the NICU include prematurity, respiratory problems, temperature instability, jaundice, hypoglycemia, surgery, and congenital abnormalities. During 2017, there were 3006 births at the hospital and 21% (n 639) of those babies were transferred to the NICU. Nationally, 1 in 5 live-born babies requires active resuscitation and 16% (n 43 348) were admitted to a special care nursery or NICU in 2015.18

METHODS

A prospective matched audit comparing the pain scores and analgesia requirements of women whose babies were admitted to the NICU with women whose babies remained on the ward was undertaken. A matched design of 2:1 (100:50) was employed, with 2 women whose babies remained on the ward matched to every 1 woman with a baby admitted to the NICU. This design was adopted to accurately compare and reflect true differences, if any, between the groups. The sample size of N 150 was selected so that differences between groups in the dependent variables (analgesia used and pain scores), which were of a moderate effect size (0.5), would be detectable using 80% power and α .05.19 Women whose babies required NICU admission were recruited and then 2 women whose babies remained on the ward were found as matches. Women were matched on the following criteria: age, number of previous births, type of birth, whether an episiotomy was performed or not, and epidural or spinal analgesia use. Data were collected on pain scores after birth at 4 hours, 8 hours, 12 hours, 16 hours, 20 hours, 24 hours, day 2, and day 3. Further data were collected on analgesia administered within the first 72 hours postbirth. Opiate-based analgesics were translated into morphine equivalents for comparison purposes.20 The opioid dose equivalence employed was intended for the comparison of different opioid regimens in individual patients or patient cohorts.20 All data collected were recorded as part of standard hospital care. Pain scores in the medical records were measured with a Numeric Pain Rating Scale from 0 to 10. Data on analgesia administration were obtained from patient medication charts.

Statistical methods

Standard descriptive statistics (frequencies and per- centages for categorical variables, means, standard deviations, and ranges for variables measured on a continuous scale) were used to summarize the study participants. Results are shown separately for each group (ward or NICU mothers). A mixed regression model (fixed and random effects) was used to identify any differences between groups in analgesia use and pain scores over time. This model was used so that correlations between measurements taken on the same mother over time could be taken into account. The model included a term for the time of measurement as a categorical variable so that no assumption of linearity be- tween this and each dependent variable was made (no assumption of a linear change over time). The assumption of normality for the dependent variables (analgesia use and pain scores) was undertaken, and the Box-Cox transformation was used to remove skewness, if found to be necessary. Statistical analyses were performed using the SAS version 9.2 software (SAS Institute Inc, Cary, North Carolina; 2008), and following convention, a P value of less than .05 was taken to indicate a statistically significant association in all tests.

Inclusion/exclusion criteria

Women who had given birth at the study hospital were eligible to participate in the study. The following exclusion criteria were applied: multiple births, women who had preexisting chronic pain or taking regular analgesia prebirth, a known history of drug abuse, and women who would be discharged prior to 72 hours postbirth. At the study hospital, women who have vaginal births typically stay in hospital for 3 days postpartum and women who have cesarean births stay for 7 days. In addition, women who experienced postpartum hemorrhage, postpartum hypertension, or other significant postpartum complications, which may have affected pain and recovery, were excluded.

Ethics

Ethical approval was obtained from the study hospital Human Research Ethics Committee (approval no. 878) and reciprocal approval from the University Human Re- search Ethics Committee (approval no. HR206/2015). Informed written consent was obtained from all participants. Potential participants were approached post- partum at least 1 day after giving birth. Each potential participant was provided with a participant information sheet that outlined the purpose and nature of the re- search. It was made clear that participation was voluntary and that there would be no adverse outcomes for women if they chose not to participate. After reading the participant information sheet, potential participants had the opportunity to discuss the study and ask questions. Every participant who consented to partake in the study was allocated a study number so that data collected from her medical record could be de-identified.

RESULTS

A total of 150 participants were matched (NICU: n 50; ward: n 100) with data collection and analysis completed. The mean age of participants was 33 (SD 3.0) years with a range of 26 to 39 years. The majority of participants had a cesarean birth (56%; n = 84), 24% (n = 36) had a spontaneous vaginal birth, and 20% (n = 30) had an assisted vaginal birth. Of the vaginal births 32% (n = 21) of participants had an episiotomy performed. Every participant received epidural or spinal anesthesia during labor. The sample consisted of 56% (n 84) primipara participants, 40% (n 60) had 1 previous birth, and 4% (n 6) had 2 previous births.

All participants had some form of analgesia ad- ministered during the 72-hour postpartum period. Simple analgesia administered included paracetamol, ibuprofen, diclofenac, and naproxen. The use

of multimodal analgesia was prevalent with 99% (n 148) of participants receiving more than 1 form of analgesia postbirth. The majority of participants (67%; n 100) received opiate-based analgesia. Opiates administered included oxycodone, codeine, tramadol, morphine, and buprenorphine. Of the participants whose babies were admitted to the NICU, 64% (n 32) required opiate analgesia and 68% (n 68) of participants whose babies remained on the ward were administered opiates. To facilitate comparisons, all opiate medications were converted into morphine equivalents,20 hence-forth referred to as opiates. There was no statistically significant difference in opiate use (Yes/No) between NICU and ward participants (P .7822). However, opiate administration was higher for participants who gave birth via cesarean birth compared with vaginal births, with opiate administration highest in cesarean births from 24 hours postbirth (see Table 1).

Consistent with the requirement for opiates (Yes/No), the morphine equivalent dose administered in the ward was similar to that in the NICU (P .9163; see Table 2). Participants with cesarean births required a higher dose than those having a vaginal birth, and the dose in the first 24 hours was lower than subsequently (see Table 2). The pattern of pain scores was similar to the administration of opiate-based medication in that there was no statistically significant difference between ward and NICU participants after adjusting for mode of birth (cesarean vs vaginal) and the postbirth time. In addition, however, participants who had an episiotomy had significantly higher pain scores than participants who did not have this procedure (see Table 3).

Figure 1 shows mean pain scores and mean of opiates administration converted into morphine equivalent doses across postbirth times and type of birth. This figure echoes mixed-models findings reported earlier demonstrating the higher opiate administration associated with cesarean births compared with vaginal births. The different times pain scores peaked on the basis of mode of birth are also illustrated (see the Figure).

DISCUSSION

Contrary to the perceptions of midwives at the study hospital, we found no statistically significant difference between the pain scores and analgesia use of NICU mothers and ward mothers. This suggests that although the NICU mothers would typically ambulate earlier than ward mothers, this had no impact on their level of pain and analgesia use. Although the emotional and psycho- logical impacts of NICU admissions on mothers are well evidenced,9–13,16,17 we found that NICU admission does not have a physiological effect on pain. There are a number of reasons why midwives might perceive NICU mothers differently. It may be that midwives have more empathy for NICU mothers than ward mothers with healthy babies. This could be particularly true because of the awareness of the acute stress NICU mothers are exposed to and the emotional and psychological effects this can have.

The reduced contact midwives have with NICU mothers, who are often away from the postnatal ward for lengthy periods of time while they visit their babies in the NICU, may also influence midwives' perceptions. It is conceivable that ward-based mothers who have more frequent contact with the midwives have more opportunity to report pain than NICU mothers who are away from the postnatal ward. Research into the perceptions of midwives hold regarding NICU mothers and ward mothers is needed to understand why these mid- wives viewed the 2 groups of mothers differently.

Our findings mirror those reported in the existing literature. We found mode of birth significantly affected pain scores and analgesia use, with mothers who gave birth via cesarean birth experiencing the most pain and requiring more analgesia.1,21,22 It is important to note, however, that statistically significant results do not necessarily equate to a clinically significant difference. In

particular, the difference in mean pain scores between participants who had an episiotomy (1.74) and participants who did not have an episiotomy (1.47) was statistically significant; however, this difference would not be considered clinically significant. When looking at pain across time, it was interesting to observe that pain scores peaked at different times for different modes of birth. For participants who had a cesarean birth, pain scores peaked at day 2. This timing correlated with the time that mothers who have had a cesarean birth typically begin to ambulate at the study hospital. For participants with assisted vaginal births, pain scores peaked at 12 hours and again at 20 hours, whereas for spontaneous vaginal births, the highest pain scores occurred at day 1. This information could be useful in helping mid- wives effectively manage postpartum pain for different modes of birth, and further research in a larger sample could reveal key time points where pain typically peaks.

The high level of spinal anesthesia and epidural ad- ministration in the sample was due to the complex nature of the births of women whose babies required NICU admission. Matching naturally required us to recruit women who met all the same criteria except for the NICU admission. Therefore, in both the groups, there is a higher incidence of cesarean births, which always require anesthesia, followed by assisted vaginal births, and finally spontaneous vaginal births. Similarly, a high episiotomy rate was observed in our sample and was due to the complexity of the births of babies requiring NICU admission and matching these complex births with babies who remained on the ward.

The main limitations of the study included being con- ducted at a single-site private hospital; the patient population may differ from those in other settings, which may limit the generalizability of the results. The study hospital has a higher NICU admission rate than the nationally reported admission rate; this is likely a reflection of the older demographic of women giving birth in the private sector compared with the public sector. Older mothers are more likely to require medical intervention during labor and birth.18 It is possible that some participants may have altered their reporting of pain and requests for analgesia due to their awareness of the data being collected for the study. Over the study period, 15 consultant obstetricians worked at the study hospital; women were under the care of 1 consultant but may be seen by other members of the medical team due to availability. Differences among prescribing by physicians and the practice of midwives could have affected the type and amount of analgesia participants received. However, this reflects real-life practice where patient care is influenced by healthcare professionals' clinical experience and patients' individual needs.

CONCLUSION

No statistically significant difference was found between the pain scores or analgesia use of mothers whose babies were admitted to the NICU and mothers whose babies remained with them. This small study is one of the first to look for physiological differences between mothers whose babies require NICU admission and mothers whose babies remain on the ward. Further research is needed to explore midwives' perceptions of these 2 groups of mothers and comparisons of pain and analgesia use should be made in other patient populations.

References

1. Declercq E, Cunningham DK, Johnson C, Sakala C. Moth- ers' reports of postpartum pain associated with vaginal and cesarean deliveries: results of a national survey. Birth. 2008;35(1):16–24.

2. Eshkevari L, Trout KK, Damore J. Management of postpartum pain. J Midwifery Womens Health. 2013;58(6):622–631.

3. Swain J, Dahlen HG. Putting evidence into practice: a quality activity of proactive pain relief for postpartum perineal pain. Women Birth. 2013;26(1):65–70.

4. de Souza Bosco Paiva C, Junqueira Vasconcellos de Oliveira SM, et al. Length of perineal pain relief after ice pack application: a quasi-experimental study. Women Birth. 2016;29(2):117–122.

5. Hadi N, Hanid AA. Lavender essence for postcesarean pain.

Pak J Biol Sci. 2011;14(11):664–667.

6. Vaziri F, Shiravani M, Najib FS, Pourahmad S, Salehi A, Yazdanpanahi Z. Effect of lavender oil aroma in the early hours of postpartum period on maternal pains, fatigue, and mood: a randomized clinical trial. Int J Prev Med. 2017; 8:29.

7. Landau R, Bollag L, Ortner C. Chronic pain after childbirth. Int J Obstet Anesth. 2013;22(2):133.

8. C¸ ıtak Karakaya I˙, Yu¨ksel I˙, Akbayrak T, et al. Effects of physiotherapy on pain and functional activities after cesarean delivery. Arch Gynecol Obstet. 2012;285(3):621–627.

9. Yurdakul Z, Akman I, Kus¸c¸u MK, et al. Maternal psychological problems associated with neonatal intensive care admis- sion. Int J Pediatr. 2009:2009:591359.

10. Henderson J, Carson C, Redshaw M. Impact of preterm birth on maternal well-being and women's perceptions of their baby: a population-based survey. BMJ Open. 2016;6(10):e012676.

11. Carter JD, Mulder RT, Bartram AF, Darlow BA. Infants in a neonatal intensive care unit: parental response. Arch Dis Child Fetal Neonatal Ed. 2005;90(2):F109–F113.

12. Flacking R, Lehtonen L, Thomson G, et al. Closeness and separation in neonatal intensive care. Acta Paediatr. 2012;101(10):1032–1037.

13. Segre SL, McCabe EJ, Chuffo-Siewert WR, O'hara WM. De- pression and anxiety symptoms in mothers of newborns hospitalized on the neonatal intensive care unit. Nurs Res. 2014;63(5):320–332.

14. Brandon DH, Tully KP, Silva SG, et al. Emotional responses of mothers of late-preterm and term infants. J Obstet Gynecol Neonatal Nurs. 2011;40(6):719–731.

15. Holditch-Davis D, Miles MS. Mothers' stories about their experiences in the neonatal intensive care unit. Neonatal Netw. 2000;19(3):13-21.

16. Turner M, Chur-Hansen A, Winefield H. Mothers' experiences of the NICU and a NICU support group programme. J Reprod Infant Psychol. 2015;33(2):165–179.

17. Wigert H, Johansson R, Berg M, Hellstro¨m AL. Mothers' experiences of having their newborn child in a neona- tal intensive care unit. Scand J Caring Sci. 2006;20(1): 35–41.

18. Australian Institute for Health and Welfare. In: Australia's Mother and Babies 2015 in Brief. Canberra, Australia: AIHW; 2017.

19. Tabachnick BG, Fidel LS. Using Multivariate Statistics. 6th ed. Boston, MA: Pearson Education; 2013.

20. Faculty of Pain Medicine ANZCA. Opioid dose equivalence: calculation of oral morphine equivalent daily dose (oMEDD). http://fpm.anzca.edu.au/documents/opioid-dose- equivalence.pdf. Published 2014. Accessed January 8, 2018.

21. Sadat Z, Taebi M, Saberi F, Kalarhoudi MA. The relation- ship between mode of delivery and postpartum physical and mental health related quality of life. Iran J Nurs Midwifery Res. 2013;18(6):499–504.

22. Chang SR, Chen KH, Ho HN, et al. Depressive symptoms, pain, and sexual dysfunction over the first year follow- ing vaginal or cesarean delivery: a prospective longitudinal study. Int J Nurs Stud. 2015;52(9):1433–1444.

Table 1. Analysis of Opiate Requirement (Yes/No). Results obtained from the GEE model. An odds ratio greater than 1 indicates a greater likelihood for opiate administration to be required than the reference group.

Variable	n/N	Odds ratio	95% Confidence Interval	p-value
Group				
NNU	77/150 (51.3)	1.09	0.58 - 2.06	0.7822
Ward	151 / 300 (50.3)	1 (reference)		
Type of delivery				
Assisted Vaginal	21/90 (23.3)	2.77	0.80 - 9.58	0.1085
Caesarean	195/252 (77.4)	48.00	15.01 - 153.42	<.0001
Spontaneous Vaginal	12/108 (11.1)	1 (reference)		
Time (post-delivery)				
24 hrs	57/150 (38.0)	0.29	0.15 - 0.55	0.0001
48 hrs	86/150 (57.3)	1.05	0.70 - 1.58	0.8140
72 hrs	85/150 (56.7)	1 (reference)		

Table 2. Analysis of opiates converted into morphine equivalent dose, for participants that required opiate-based analgesia. The results of the Mixed model show the adjusted mean doses, their 95% confidence intervals and p-values.

Variable	Number of Doses Adjusted mean (SE)	95% Confidence Interval	p-value
Group			0.9163
Ward	29.5 (5.3)	19.0 – 40.0	
NNU	28.9 (6.6)	15.9 – 41.9	
Type of delivery			<0.0001
Assisted vaginal	15.6 (8.7)	0.0 – 32.9	
Spontaneous Vaginal	18.5 (12.1)	0.0 – 42.4	
Caesarean	53.5 (3.3)	47.0 – 60.0	
Time (post-delivery)			0.0005
24 hrs	19.8 (5.7)	8.6 – 31.1	
48 hrs	37.9 (5.7)	26.7 – 49.2	
72 hrs	29.9 (5.9)	18.3 – 41.5	

Table 3. Analysis of Pain Scores, with results found from the Mixed model. Adjusted mean pain scores are from analysis of the raw pain scores, while the p-values were from the analysis of the transformed pain scores (using the Box-Cox transformation).

Variable	Number of Doses Adjusted mean (SE)	95% Confidence Interval	p-value
Group			0.8937
Ward	1.68 (0.13)	1.42 – 1.94	
NNU	1.53 (0.16)	1.20 – 1.85	
Type of delivery			<0.0001
Assisted vaginal	1.51 (0.19)	1.14 – 1.87	
Spontaneous Vaginal	2.17 (0.18)	1.82 – 2.52	
Caesarean	1.13 (0.19)	0.75 – 1.51	
Episiotomy			0.0359
Yes	1.74(0.24)	1.27–2.21	
No	1.47 (0.11)	1.24 – 1.69	
Time (post-delivery)			<0.0001
4 hrs	0.99 (0.17)	0.66 – 1.31	
8 hrs	1.25 (0.17)	0.92 – 1.59	
12 hrs	1.42 (0.17)	1.09 – 1.76	
16 hrs	1.25 (0.17)	0.91 – 1.59	
20 hrs	1.66 (0.17)	1.32 – 2.01	
24 hrs	1.85 (0.18)	1.50 – 2.19	

48 hrs 72 hrs	2.38 (0.16) 2.03 (0.17)	2.06 – 2.70 1.71 – 2.36