

Management Practices of Postoperative Pain in Neonates at Newborn Unit, Moi Teaching and Referral Hospital, Kenya

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Abstract

Introduction: Neonates undergoing surgeries in hospitals worldwide undergo average to severe postoperative pain. Surmounting evidence demonstrates that, controlling pain in the neonatal period is beneficial in improving physiologic, behavioral, and hormonal outcomes. However, there is paucity of information by the health care providers regarding knowledge and skills on postoperative neonatal pain management.

Objective: The objective of the study was to describe management of postoperative pain among neonates at the new born unit in Moi Teaching and Referral hospital (MTRH), Kenya.

Methodology: The study design was a prospective descriptive study conducted at the newborn unit, MTRH. Data collection tools and procedures used were check list for observation of pain management practices and health care provider questionnaire to interview nurses and pediatric doctors in regard to management of postoperative pain in neonates in order to augment observation data. Data analysis consisted of descriptive (mean, median and standard deviation) and inferential (logistic regression and correlation) statistical procedures. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 21.0 program and presented in tables, graphs, frequencies and content analysis.

Results: Data from 68 neonates and 45 health care providers were collected for this study on the basis of inclusion and exclusion criteria. Enrolled neonates had a birth weight of 2.6 ± 0.74 kg (mean \pm SD; range: 1.3–4.7 kg); gestational age at birth of $38 \pm .14$ weeks (range: 34–40 weeks), age in days at surgery of 6 ± 8.5 weeks (range: 1–40 days), Heart rate on admission was 149 ± 4.6 (range: 138–162 beats per minute); and Oxygen saturation in percentage was 99 ± 1.1 percentage (range: 96–100 percentage). Most neonates (91.2% [n = 68]) underwent major surgery, where by 30.9 % had anorectal malformation [n=68]. Majority of the neonates 65 (95.6%) experienced severe pain at the 9th hour postoperatively. Tramadol was the main analgesic used. Tactile soothing and talking to the postoperative neonates were the main nonpharmacological methods used.

Conclusion: From the study, there was no standardized postoperative neonatal pain assessment scale in place in the new born unit at Moi Teaching and Referral Hospital leading to subjective management of neonatal postoperative pain. In addition, Tramadol was found to be the drug of choice used in managing neonatal pain. The nonpharmacological methods used were tactile soothing and talking to the neonates. Further, there were no objective tools and management guidelines to assess neonatal pain at the newborn unit which resulted to irregular neonatal postoperative pain management.

Recommendation: Evidence-based guidelines for postoperative care are needed for all providers of neonatal care in this unit. In addition, there is need for continuing professional education for all professional staff on the systematic assessment and management of postoperative pain in neonates.

Key words: Neonate, management practices, postoperative pain.

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I. Introduction

During the past two to three decades, many changes in the management of pain in the neonatal population have evolved. These changes began with the rejection of previously held misconceptions that neonates do not feel, experience, or react to pain because of the immaturity of their peripheral and central nervous system (CNS). These tenets, compounded by fears of addiction, concerns regarding the potential adverse effects of opioids and the lack of effective pharmacokinetic data has led to the under-treatment of pain

in the operating room and during the neonatal perioperative period [9]. However, such practices began to change after the publication of studies demonstrating that neonates, children and adults experience similar levels of postoperative pain [14]. Studies done by [1] showed that measurable alterations in physiologic and biochemical markers of stress existed following painful stimuli even in preterm neonates. In fact, when compared with the adult population, the changes in stress markers such as endogenous catecholamines and adrenocortical hormones were several-fold higher in neonates compared to their adult counterparts [1].

Until recently, it was incorrectly thought that nociception was diminished in preterm neonates due to the immaturity of their Central Nerves System (CNS). Skin receptors and sensory nerves around the mouth appear as early as the 7th week of gestation [3]. The immaturity of the CNS preferentially affects descending inhibitory pathways which modulate synapses in the dorsal horn of the spinal cord, which do not appear until the 32nd week of gestation. Thus, the developmental immaturity of the CNS potentially makes the preterm neonate more, rather than less, likely to feel pain. Aside from humanitarian and ethical concerns, the inadequate treatment of pain during neonatal period may have long-lasting physiologic and neuro-development consequences, including increased susceptibility to chronic pain syndromes, and a heightened sensitivity to subsequent painful stimuli which may persist throughout childhood [3]. During major surgical procedures including surgery for congenital heart disease, for instance, uncontrolled sympathetic stress responses can have significant deleterious effects on physiologic function and may impact outcome [5]. These concerns have resulted in a significant emphasis on improving and optimizing the techniques of postoperative analgesia for neonates.

Management practices and resources for postoperative pain management in neonates are minimal in low-income countries [13]. Pain assessment and treatment decisions are influenced by practice settings and the characteristics of the health care providers such as professional education and personal pain experience. Research has shown that, the use of a standardized pain assessment tool results in providing ratings of postoperative pain that match more closely to the neonates' pain experience [17]. Lack of peer reviewed past research in the management of postoperative pain in neonates in Kenya and particularly at Moi Teaching and Referral Hospital prompted the researcher's objective to effectively study postoperative pain management practices among neonates admitted in the newborn unit. The primary objective of this study was to determine the management practices of postoperative pain in neonates and identifying specific target areas for improvement in clinical practice.

The objective of the study was to describe management of postoperative pain among neonates at newborn unit, Moi Teaching and Referral hospital, Kenya.

II. Methods

Study design: The prospective descriptive study design was used.

Study locale: The study site was at NewBorn Unit (NBU) at the Moi Teaching and Referral Hospital (MTRH), Kenya.

Study population: health care provider including nurses and pediatric doctors.

Sample size: Data from 68 postoperative neonates and 45 health care providers were collected for this study on the basis of inclusion and exclusion criteria. Each neonate was observed after every three hours in conjunction with the normal time of taking neonatal vital signs up to 48 hours postoperatively.

Data collection tools: The study used check list for observation of pain management practices. In addition, questionnaire for health care provider, interviewed nurses and pediatric doctors in regard to management of postoperative pain in neonates in order to augment observation data.

Data procedures: The nurses and doctors filled a questionnaire enquiring factors contributing to individual assessment and management of postoperative pain. The researcher used CRIES scale to rate the observation of pain assessment. The immediate intervention undertaken in case a neonate was in pain was also observed and recorded by the researcher

Data Analysis: Aided by Statistical Package for the Social Sciences (SPSS) version 21.0 program and presented in tables, graphs, frequencies and content analysis.

Ethical approval: Was obtained from Institutional Research and Ethics Committee (IREC) based in Moi University and Moi Teaching and Referral Hospital. Permission was sought from the hospital management and nurse in charge at NBU to collect data from postoperative neonates, nurses and doctors working at NBU during the period of study. Consent was obtained from the neonates' mothers to permit their participation in the study. Further, an informed consent was sought from each health care provider before being interviewed by use of the semi-structured questionnaire. Participation was voluntary and the information provided was treated with the utmost regard for confidentiality and anonymity.

III. Results

Enrolled neonates had a birth weight of 2.6 ± 0.74 kg (mean \pm SD; range: 1.3–4.7 kg); males were 37 (54%) in this study [N=68]; gestational age at birth of 38 ± 0.14 weeks (range: 34–40 weeks), age in days at surgery was 6 ± 8.5 weeks (range: 1–40 days), Heart rate on admission was 149 ± 4.6 (range: 138–162 beats per minute); and Oxygen saturation in percentage was 99 ± 1.1 percentage (range: 96-100 percentage). Most neonates (91.2% [n = 68]) underwent major surgery, where by 30.9 % had anorectal malformation [n=68].

Table 1: Neonatal Diagnosis

| | Frequency | Percent |
|-------------------------------------|-----------|---------|
| Anorectal malformation | 21 | 30.9 |
| Gastroschisis | 17 | 25 |
| Hirshsprung disease | 4 | 5.8 |
| Breast abscess | 2 | 2.9 |
| Ileal Atresia | 2 | 2.9 |
| Intestinal obstruction | 2 | 2.9 |
| Omphalocele | 2 | 2.9 |
| Arm Gangrene | 1 | 1.5 |
| Bucket Handle with perineal fistula | 1 | 1.5 |
| Burst abdomen | 1 | 1.5 |
| Colonic Atresia | 1 | 1.5 |
| Craniopharyngioma | 1 | 1.5 |
| Duodenal Atresia | 1 | 1.5 |
| Gingival tumor | 1 | 1.5 |
| Hand gangrene | 1 | 1.5 |
| Hydrocephalus | 1 | 1.5 |
| Intussusception | 1 | 1.5 |
| Meningocele | 1 | 1.5 |
| Necrotizing | 1 | 1.5 |
| Pyomyositis | 1 | 1.5 |
| Rectal Atresia | 1 | 1.5 |
| SacroTeratoma | 1 | 1.5 |
| scrotal hernia | 1 | 1.5 |
| Spina bifida | 1 | 1.5 |
| Umbilical hernia | 1 | 1.5 |
| Total | 68 | 100 |

The researcher found that majority of the neonates 21 (30.9%) had anorectal malformation, gastroschisis 17 (25%), Hirshsprung disease 4 (5.8%) then the other conditions were found in two or only one neonates as illustrated on the table 3 above. Most of the neonates 62 (91.2% [n = 68]) had major operation.

Table 2: Association between CRIES scores and the pharmacological intervention.

KEY:

Yes- Analgesic received

No- Analgesic not given.

| Hour of intervention | | 0-3 scores | 4-10 scores | p-value |
|----------------------|-----|------------|-------------|---------|
| 3 rd | No | 44 | 20 | 0.013* |
| | Yes | 0 | 4 | |
| 6 th | No | 11 | 46 | 0.190* |
| | Yes | 0 | 11 | |
| 9 th | No | 3 | 47 | 0.560* |
| | Yes | 0 | 18 | |
| 12 th | No | 9 | 39 | 0.050* |
| | Yes | 0 | 20 | |
| 15 th | No | 13 | 43 | 0.104* |
| | Yes | 0 | 12 | |
| 18 th | No | 15 | 45 | 0.184* |
| | Yes | 0 | 8 | |

| | | | | |
|------------------|-----|----|----|--------|
| 21 st | No | 16 | 47 | 0.330* |
| | Yes | 0 | 5 | |
| 24 th | No | 16 | 42 | 0.101* |
| | Yes | 0 | 9 | |
| 27 th | No | 18 | 42 | 0.099* |
| | Yes | 0 | 8 | |
| 30 th | No | 17 | 41 | 0.098* |
| | Yes | 0 | 9 | |
| 33 rd | No | 19 | 39 | 0.052* |
| | Yes | 0 | 9 | |
| 36 th | No | 19 | 42 | 0.178* |
| | Yes | 0 | 7 | |
| 39 th | No | 21 | 39 | 0.096* |
| | Yes | 0 | 8 | |
| 42 nd | No | 19 | 41 | 0.095* |
| | Yes | 0 | 8 | |
| 45 th | No | 20 | 40 | 0.094* |
| | Yes | 0 | 8 | |
| 48 th | No | 35 | 28 | 0.047* |
| | Yes | 0 | 4 | |

*Fisher's exact test.

Proportion of neonates in severe pain and received pharmacological intervention.

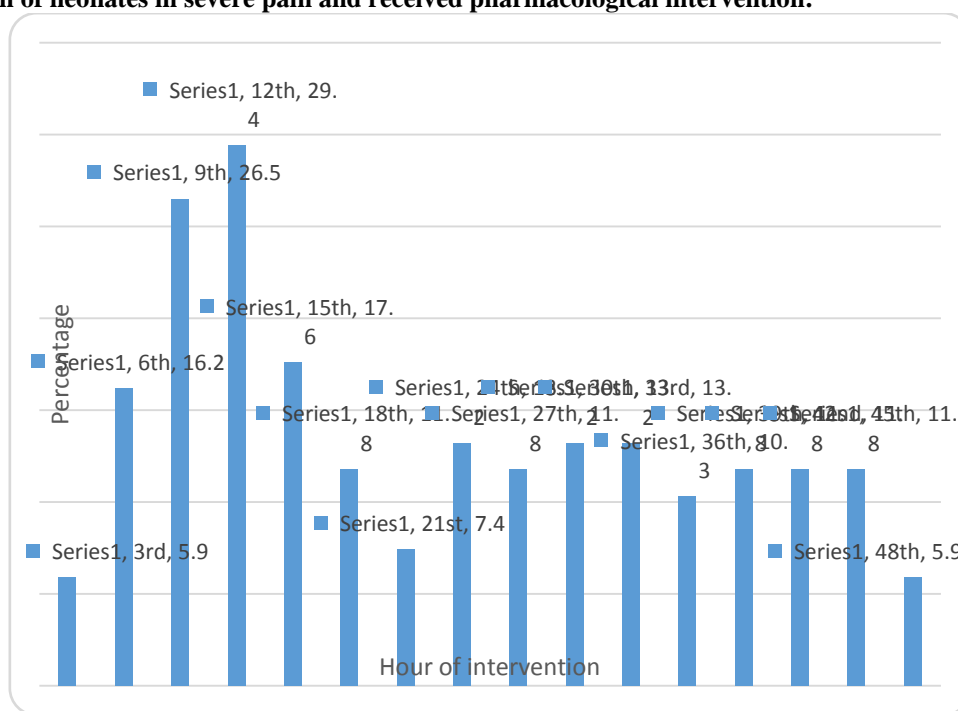


Figure 1: Received pharmacological interventions

At the 9th hour postoperatively 18 (26.5%) and 12th hour postoperatively 20 (29.4%) neonates were found in severe pain and received analgesics. Neonates with severe pain at the 3rd hour postoperatively were 24 (35.4%) and only 4 (5.9%) received analgesics. At the 48th hour postoperatively 32 (47.1%) were found to be in severe pain and only 4 (5.9%) received analgesics. Tramadol was the only analgesic on use at the NBU.

Administration of analgesics for neonatal postoperative pain during the 48-hour study period was variable 66 (97%) at a point in time. Neonates received pharmacological intervention irrespective of major or minor operation. A small proportion 2 (3%) received no postoperative analgesia.

Proportion of neonates in severe postoperative pain and no pharmacological intervention.

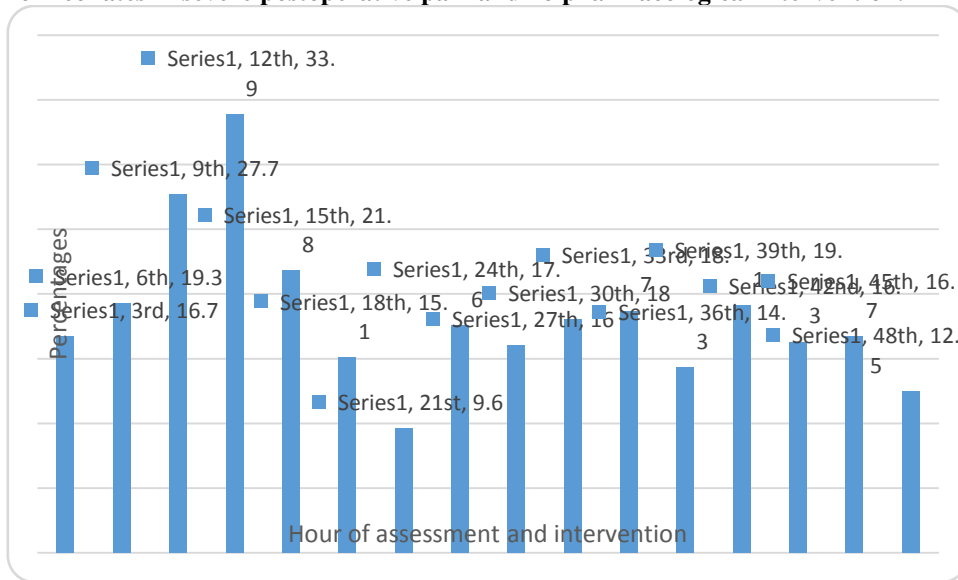


Figure 2: Missed pharmacological intervention

Majority of the postoperative neonates were found to be in severe postoperative pain and were not given any analgesic as demonstrated in the figure 7 above. At the 21st hour 47/52 (90.4%) were found in severe postoperative pain and only 5/52 (9.6%) received no pharmacological intervention. All these neonates in severe postoperative pain received non-pharmacological interventions such as tactile soothing (100%) and talking to the neonate (100%). At the 12th hour postoperative 20/59 (33.9%) were found to be in severe postoperative pain and were not given any analgesic as demonstrated in the figure above.

Proportion of neonates who did not deserve any intervention at one point

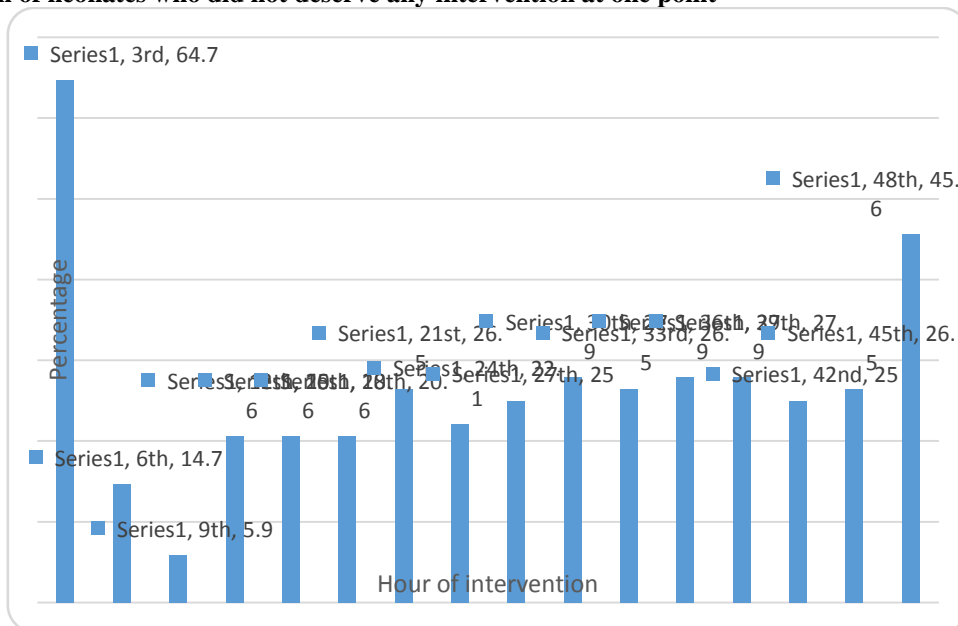


Figure 3: No postoperative pain management deserved.

Majority of the neonates 44 (64.7%) N=68; had low CRIES scores (0-3) at the 3rd hour postoperatively hence did not receive any pharmacological neither non pharmacological intervention. At the 9th hour postoperatively only 4 (5.9%) neonates who had scores of 0-3 hence did not receive any intervention to alleviate pain. The researcher found that by 3rd hour 44 (64.7%) following operation, majority of the neonates were not in severe postoperative pain hence no intervention was undertaken.

IV. Discussion

Findings from this study were unique because they represented actual practice rather than the opinions of professional staff at NBU and they focused only on the care of neonates for the first 48 hours after surgery. The researcher found numerous inconsistencies in the assessment and management of postoperative pain in the NBU such as no hospital standardized guidelines for neonatal assessment and management of postoperative pain as evidenced by [11] that each hospital should establish a neonatal pain control program.

Pharmacologic management for postsurgical analgesia was variable, only tramadol was in use. Observations confirmed the extreme variability in postoperative pain management consistent with [6] on the basis of inadequate or inaccurate assessments [10]. The inability to communicate postoperative pain to caregivers, and evidence for the long-term effects of unrelieved pain make these findings more troubling.

A prerequisite for adequate pain management is the routine assessment of pain in neonates. The data showed that NBU nurses do not use objective pain-assessment tools, whereas the prescriptive authorities (doctors) do not prescribe analgesics. According to [15], this variability among professionals reveals, to a significant extent, the reluctance to use analgesic drug therapy for neonates.

Despite the variability of pharmacologic analgesia in this population, it was most disconcerting that in the 48-hour period after a surgical procedure 66 (97%) of patients received opioid analgesia sparingly at one point of time and only 2 (3%) received no analgesia at all. [8] e evidenced that opioid complications of respiratory depression resulted to abscess of the drug use for pain management in postoperative neonates, despite a deeper understanding of neonatal opioid pharmacology. Tramadol remained the most commonly used analgesics after surgery, none of the neonates in this study received acetaminophen or sedative medications, which can mask the pain response without relieving pain. The use of oral sucrose, which has analgesic effects in the neonate, was virtually absent, perhaps because the efficacy of sucrose for post-surgical pain has not been investigated according to [16], it remains critical to achieve adequate pain control in neonates, both as an ethical duty and because painful experiences in the NICU can have long-term adverse effects [18].

Cochrane systematic review by [2] and companions found insufficient evidence to recommend the routine use of opioids. Although there appeared to be a reduction in pain, there were no long-term benefits favoring the treatment groups; and concerns for adverse effects, such as respiratory depression and development of dependence and tolerance, were raised [7]. The use of oral or intravenous acetaminophen has been limited to postoperative pain control. Although intravenous acetaminophen has not been approved by the US Food and Drug Administration (FDA), preliminary data on its safety and efficacy are promising in neonates and it may decrease the total amount of morphine needed to treat postoperative pain according to Cochrane Systematic review by [12].

In comparing knowledge and experience in managing of neonatal postoperative pain, it was found that doctors were more knowledgeable on pain assessment cues than nurses but in the intervention there was no difference. [19]Conducted a study to determine how nurses' education and clinical experience influence nurses' interpretation of neonatal postoperative pain. The study revealed that the specialist nurses tended to perceive lower levels of physical pain than the generalist nurses. It is possible that nurses who deal with postoperative pain management on a regular basis may become desensitized to the neonate's perception of pain. This justifies the research findings that postoperative neonates were found to be in severe pain but only few received analgesics. [4]Cited that the major goal in the management of postoperative pain is to minimize the dose of medications in order to lessen the side effects, while still providing adequate analgesia. This therefore calls for the health providers to be keen in alleviating postoperative pain in neonates.

V. Conclusion and Recommendations

The study concluded that there was no standardized postoperative neonatal pain assessment scale in place in the new born unit at MTRH, leading to subjective management of neonatal postoperative pain. Also, the study found out that Tramadol was the drug of choice used for managing neonatal pain at the unit. On the other hand, the non-pharmacological methods used were tactile soothing and talking to the neonates. Further, there was no provision of objective tools to assess neonatal pain and management guidelines which resulted to irregular neonatal postoperative pain management.

The study therefore recommended the need for evidence-based guidelines for postoperative care for all providers of neonatal care in this unit. In addition, there is need for continuing professional education for all professional staff working at the newborn unit on the systematic assessment and management of postoperative pain in neonates.

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