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Research Article

Assessment and Management of Neonatal Pain at Neonatal ICUs in Gaza Strip, Palestine: A Multicenter Clinical Audit

Khamis Elessi[1], Shireen Abed[2], Tayseer Afifi[1]*, Alaa Alaqad[1], Hassan Abu-Alhatel[1], Mahmood Elblbessy[1] and Mohammed Obeid[1]

[1]Faculty of Medicine, Islamic University of Gaza, Gaza, Palestine

[2]Nassr Pediatric Hospital, Ministry of Health, Gaza, Palestine

***Corresponding Author:** Tayseer Afifi, Faculty of Medicine, Islamic University of Gaza, Gaza, Palestine.

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Abstract

Background: Assessing and properly managing neonatal pain have become increasingly appreciated with correction of past misconceptions and better understanding that neonates, including preterm infants, experience pain and the potential effects of inadequate pain control. Varying degrees of neonatal discomfort or pain may occur during routine patient care, moderately invasive procedures, or more invasive procedures. Pain is most common and intense in infants admitted to the neonatal intensive care unit (NICU). Thus, this audit aims to ensure that neonates receive adequate pain control.

Objectives: Aims of the present study were (1) to compare the current practice regarding neonatal pain to the best available evidence, (2) to explore intuitive clinicians' ratings by relating them to the tool's items and (3) to provide an evidence-based tool to health care professionals in order to enable them to easily evaluate neonatal pain.

Methods: A clinical audit was carried out at 3 Neonatal Intensive Care Units (NICUs) in Gaza Strip, Palestine. The sample was selected prospectively over a period of about two months. We employed modified pain assessment tool and Covers Scale (mPAT) in order to assess neonatal pain during procedures. This tool is adopted from Australian and New Zealand Neonatal Network (ANZNN) 2016.

Results: Our audit involved 40 neonates in each center. Majority of them were males and all were under 28 days of age. Most neonates were admitted to the NICU during the first 24 hours of life. They were exposed to various painful and stressful procedures. Most neonates experienced mild to moderate pain during these procedures by our assessment. Despite that, they didn't receive the adequate care they needed. The clinical practice varied markedly among the three centers.

Conclusion: Clinicians have adequate foundation regarding neonatal pain, but some gaps exist between the exhibited knowledge and actual practice. This drawback could be remedied by integrating some comprehensive and validated pain assessment tools and adopting the best available evidence –based management guidelines.

Keywords: *Pain; Assessment; Neonates; Neonatal Intensive Care Unit; Modified Pain Assessment Tool (mPAT); Gaza Neonatal Network (GNN)*

Introduction

All newborns experience acute episodic of pain or prolonged, continuous pain during admission to NICUs as a result of diagnostic or therapeutic interventions or as a result of diseases process [1,2]. Untreated neonatal pain prolongs human suffering and is often associated with short-term and long-term physical, behavioral, or cognitive consequences [3,4]. Conversely, some analgesic drugs can prolong

mechanical ventilation [5], delay feedings [6] or impair brain growth and development [7-9]. Pain needs to be assessed before treatment, but neonatal pain assessments are time- and labor-intensive and difficult to implement in routine NICU care [10-12].

As a result of medical and technological progress in developed countries, extremely premature neonates and term neonates with severe diseases often survive, even with life-threatening complications. The routine procedures for diagnosis and treatment frequently cause pain in newborns. All newborns undergo at least one painful procedure during their first few days of life (newborn screening and sometimes heel lancing for bilirubin). The impact of pain and distress may have short (physiological and behavioral) and long-term consequences (increased or decreased behavioral responses to pain) [13]. Yet, pain in neonates has been under-recognized, under- treated and frequently not evaluated or reassessed [14]. Despite the vast body of literature supporting the recommendations for assessment and management of neonatal pain, practice remains inadequate and inconsistent.

With growing awareness of the importance of adequate neonatal pain management the past several years, many developed countries such as the United States and Canada have established their own guidelines to alleviate pain and suffering in newborns [15]. However, very little research has been conducted on this subject, and pain management in neonates is still an unevolved area in many developing countries, such as Palestine. Neither physicians nor nurses have attended to pain concerns, as it is generally accepted that neonates cannot feel pain. Pain in neonates is thus neglected in hospitals. Nevertheless, our local guidelines, here in Palestine, lack the enough information and details on this topic. Thus, and after counseling Gaza Neonatal Network, it was decided to conduct this audit on neonatal pain.

In this study, we present the current knowledge and practice by health care providers in NICUs. The aims of this paper are (1) to compare the efficacy of facilitated neonatal pain management, including non-pharmacological methods, in reducing pain during various procedures in infants against up-to-date recommendations, (2) to improve acute and chronic pain measurements for neonates in NICUs through implementation of the modified pain assessment tool and (3) to ensure that neonates receive adequate pain control.

Methods

Study design and settings

The audit was conducted at three Neonatal Intensive Care Units (NICUs) in Gaza Strip. They were Nassr Pediatric Hospital (NPH), Nasser Medical Complex (NMC) and European Gaza Hospital (EGH). The study included a total of 120 neonates, 40 per center. The study was held during the period of 50 days. However, we faced one limitation which was that some neonates were sedated at time of assessment.

Data collection

Five medical students were trained for one week on study protocol, tools and data collection techniques of the study. Data were collected by observing neonates during a painful procedure using mPAT scale. In addition to the assessment tool, the study collection sheet included data about gender and age of the neonate and we documented the procedure type as well as the intervention taken following the procedure. The data collection sheet was revised after conducting a pilot survey among 10 neonates.

Choice of tools

The mPAT is an observational scale designed to assess neonatal pain. The mPAT is a modification of the original Pain Assessment Tool (PAT) scale that was first developed and piloted on the Butterfly Ward by Hodgkinson, Bear, Thorn and Blaricum (1994). The mPAT scale was modified by O'Sullivan, Rowley, Ellis, Faasse, and Petrie (2016) and piloted at The National Women's Newborn Intensive Care Unit at Auckland City Hospital, New Zealand. It is a multidimensional pain assessment tool that was specifically designed for neonates undergoing surgical intervention. The mPAT has been validated for surgical and non-surgical neonates, from 24 weeks gestation to full term, up to 6 months old. The mPAT scale focuses on the following behavioral and physiological responses to painful stimuli and includes a nurse's perception indicator (Figure 1).

Parameters	0	1	2
The modified Pain Assessment Tool (PAT)			
Posture/tone	Relaxed Normal Some flexion	Extended Digits widespread Trunk rigid Limbs abducted Shoulders raised off bed	Flexed and/or tense Fists clenched Trunk guarded Limbs drawn to midline Head/shoulders resist posturing
Cry	No	Yes Consolable Can be settled	Yes When disturbed Does not settle after handling Loud Whimpering Whining
Sleep pattern	Relaxed	Easily woken	Agitated or withdrawn Wakes with startle Restless Squirming No clear sleep/wake pattern Eye aversion or "shut out"
Expression	Relaxed Normal	Frown Shallow furrows Eyes lightly closed	Grimace Deep furrows Eyes tightly closed Pupils dilated
Color	Pink, well perfused	Occasionally mottled or pale	Pale/dusky/flushed Palmar sweating
Respirations	Normal baseline rate	Tachypnea At rest	Apnea At rest/with handling
Heart rate	Normal baseline rate	Tachycardia At rest	Fluctuating Spontaneous/at rest
Oxygen saturation	Normal	Fleeting desaturation	Desaturation with/without handling
Blood pressure	Normal	Fluctuates with handling	Hypo-/hypertension at rest
Nurse perception	No pain perceived by me	I think the baby has pain only with handling	I think the baby is in pain

Figure 1: *Modified pain assessment tool [16].*

Statistical analysis

The collected data were entered in Microsoft Excel. Data were analyzed by the SPSS version 23. Frequency distributions and percentages were computed for all the variables.

Ethical consideration

Ethical clearance was obtained from Directorate General of Human Resources Development at Ministry of Health, State of Palestine. Written consent was gained form health care centers' heads to enable us to review medical records. Study objectives, data collection procedures, benefits and risks of the study, confidentiality, and anticipated use of the results were explained to research committee in the ministry in detail before executing our work.

Results

Neonatal characteristics

Based on the analysis of the whole cohort, 73 were males and the mean age was 8 days (Figure 2A and 2B). Most neonates were admitted to NICUs at early neonatal period. Neonates were assessed during various procedures ranging from simple procedures to severe procedures. Most procedures were either diagnostic or therapeutic. The most frequent procedure was mechanical ventilation while chest tube placement was the least frequent procedure among our sample. Figure 3 shows the frequency of procedures during which neonates were assessed. Some neonates were sedated during the procedure and they accounted for 38 neonates of the sample.

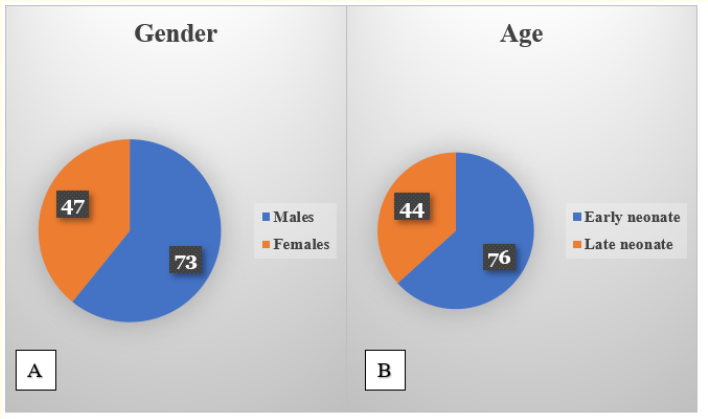

Figure 2A and 2B: *Gender and Age distribution respectively.*

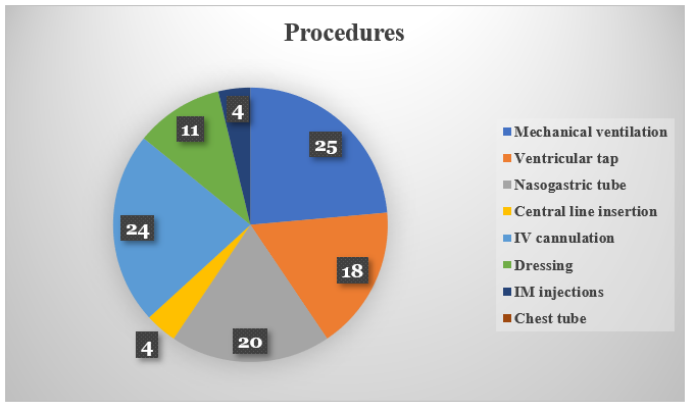

Figure 3: *Frequency of procedures.*

Pain assessment

Neonates were assessed during procedures and they varied in their scores. Most neonates scored less than five, which means they didn't feel much pain during the procedure. On the other hand, 38 neonates experienced intense pain in invasive procedures. The rest neonates scored 5 - 10 as assessed by observers. As shown in figure 4, the number of neonates who scored less than five is similar among three centers. Interestingly, high pain scores varied among hospitals. Which is explained by different procedures' intensity that neonates experienced.

Pain management

The type of intervention to be NMCs, non-opioid analgesia or even the use of dose-adjustment opioids depends on mPAT score value which clarified in table 1. However, clinical judgment and collaboration with the multidisciplinary team is advised [16].

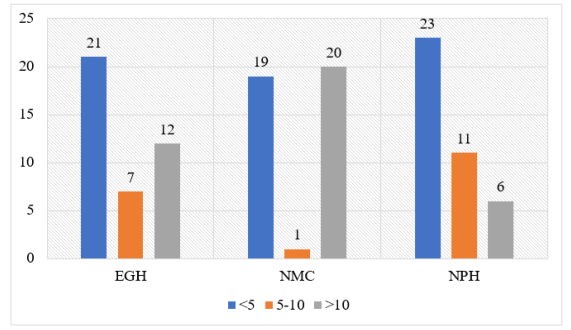

Figure 4: *Assessment score.*

mPAT Score	Intervention
< 5	Nursing comfort measures
5 - 10	Paracetamol/Clonidine/Other Non-Opioid Analgesia with Nursing comfort measures
> 10	Opioids with Non-Opioid Analgesia/Analgesia Dose adjustment with Nursing comfort measures

Table 1: *Intervention guide based on mPAT score [16].*

Based on scores in figure 4, most neonates scored less than five in which only NCMs are needed. However, it was found that, most not all, health professionals lack the enough knowledge about this approach. We found that all neonates with score less than five were offered nursing comfort measures to relieve their pain at NMC, but this wasn't offered at either EGH or NPH. On the other hand, most neonates who scored 5 - 10 received adequate analgesia in all three centers. And neonates who scored more than 10 were sedated following the procedure and received caffeine citrate to improve their breathing.

It is important to say that we observed some gaps in the clinical practice in which the neonate was neglected after the procedure in case of less than five score at EGH and NPH. Interestingly, very few numbers of neonates received analgesia they didn't need and on the contrary three neonates, who needed non-opioid analgesia received nothing. Furthermore, the results were remarkably different among centers. This mandates the presence of unified systemic approach for neonatal pain. Figure 5 summarizes the interventions taken for neonates following the procedures. The numbers are presented collectively in all centers.

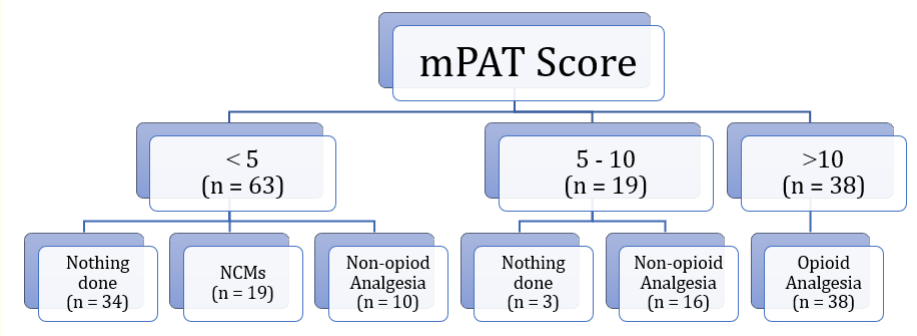

Figure 5: *Intervention taken by health professionals to relieve pain.*

Internal consistency

There are no studies that report the internal consistency of mPAT scale. We did the assessment after a pilot study in which we found that our setting lacks the measurement of blood pressure and there is no nurse perception. So, we deleted the last two items of the original scale so as to suit our NICUs. We got 0.76 Cronbach's alpha for mPAT. However, if we removed the respiration assessment from the scale, it will reach 0.81.

Statistical relationship

There was no statistical significance between neonatal age and mPAT score. Which supports the fact that neonates feel pain or at least they are alert to stressful stimuli regardless of their age.

Discussion

To the best of our knowledge, we report the first prospective, observational study auditing the clinical practice regarding neonatal pain in Palestine.

Our results have shown that neonates admitted to NICUs are exposed to large numbers of either painful or stressful procedures during their hospitalization. Neonatal pain guidelines recommend repeated pain assessment every 6 - 8 hours daily [17,18].

It is interesting to stress that although admitting that some procedures are very painful, nurses have reported that in their daily professional practice such procedures have been performed without any type of pain relief measures.

Mechanical ventilation was the procedure more often indicated for the use of pain relief measures, probably due to the fact that it is performed by the pediatric surgeon, according to medical protocol. Tracheal aspiration and gastric probe, on the other hand, were mentioned as never performed with pain relief measures in the studied NICU. These results are similar to other studies [19,20] which concluded that most invasive procedures were performed without adequate pain relief measures. In a Canadian study [21], for example, the understanding of pain during invasive procedures is broad and universal; however, it is still necessary a dialog between health professionals and researchers aiming at discussing changes in behavior and in professional practice with regard to children's pain. So, there is inconsistency between conception and action of these health professionals with regard to neonatal pain - it exists and is identified by NN behavioral indicators, even without understanding neonatal pain scales; most invasive procedures are considered very painful and should be followed by pain relief measures, especially chest drainage, venous or arterial puncture and lumbar puncture, with exception of gastric probe - however, pain is not routinely controlled.

We noticed a remarkable discrepancy in regards to pain management among all NICUs. Some units used pharmacological and non-pharmacological interventions, while other unites didn't attempt to do anything for neonates and the intervention column of analysis was filled with nothing. This can occur for several reasons and the researchers explain it by lack of culture of non-pharmacological approach and family involvement in some situations. NCMs are of great value in pain relief whether they are applied isolated or as complementary measures to pharmacological treatment [22].

Some studies found that health professionals prefer the pharmacological treatment which also can be explained by the lack of knowledge of NCMs role in comforting neonates [23]. This would be a potential field for nursing training and implementation in our settings. Furthermore, inter-professional trust and support for evidence-based practice in a prominent barrier in the use of pharmacological intervention for pain relief. As some professionals still argue about neonatal pain issue and report that medications might have some considerable side effects on neonatal liver and kidneys.

NICU pain management should be developed in order to suit the practice in our settings. In this sense, the qualification of such professionals and the conducting of studies on compliance with pain management are justified. A strategy in this direction would include

discussions with the whole health care providers teams, not only with nurses, about variables helping and making difficult the effective adoption of adequate pain relief measures during invasive procedures in the NICU, trying to identify socio-cultural and organizational factors of this process.

The coexistence of these factors with the adoption of a pain management protocols seems to be more appropriate. These invasive procedures are routinely performed by a physician, which assures the adoption of pain control measures. So, the type of professional qualification and the existence of a protocol seem to be variables controlling NICU pain management.

It is clear that several scoring tools have been developed, the use of a single assessment tool to address all the needs for neonates is not advisable as each tool was developed and validated for selected populations and clinical settings. The choice of the pain assessment tool is dependent upon the neonatal population to be assessed, and the different types of pain that need to be evaluated. Thus, the team next step is to adopt another tool and compare it to the tool used in this study and consequently develop a combined tool which is suitable for Gaza Strip NICUs.

Conclusion

Neonates were exposed to numerous invasive painful procedures without appropriate assessment and, in turn, improper pain management in hospitals in Gaza Strip, Palestine. The potential long-term impacts of poorly treated pain in neonates call for a change in neonatal practice. It is obvious from the results that neonates feel pain regardless their age. We believe that our data and analysis in neonatal pain can bring more attention to this field. And we recommend that NICU clinical practices should consider including routine assessments of continuous pain in neonates.

Competing Interest

Authors declare that they have no competing interests.

Authors' Contribution

Afifi T, Elessi K and Abed S conceptualize the research study idea and designed the data collection sheet and conducted the pilot study. Afifi T, Abu-Alhatel H, Alaqad A, Obeid M and Elbebessy M collected the data and entered them to SPSS. Afifi T analyzed the data and wrote the initial draft. The draft was revised and the final draft was prepared by Afifi T. Elessi K supervised the whole process.

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Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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