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Pain management during arterial puncture in newborns: a descriptive study

Manejo da dor durante a punção arterial no neonato: estudo descritivo

Manejo del dolor durante la punción arterial en neonatos: estudio descriptivo

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ABSTRACT

Objective: to describe pain relief measures applied by the nursing team during arterial puncture in neonates, and pain scores during the procedure. **Method:** this descriptive, quantitative study was conducted between October 2018 and January 2019 at a neonatal intensive care unit in northwestern Paraná, by non-participant observation of 192 arterial punctures and measurement of the respective pain scores. The study was approved by the human research ethics committee. **Results:** of the 192 punctures, only 34 were examined for relief measures and pain scores; the latter were found to be high. The other punctures were excluded for loss of monitoring during the procedure. **Conclusion:** pain-relief interventions were little used by the team. The observation process found intense pain.

Descriptors: Nursing Care; Neonatal Nursing; Pain Management; Observation.

RESUMO

Objetivo: descrever as medidas de alívio da dor aplicadas pela equipe de enfermagem durante a punção arterial no neonato e os escores de dor no momento do procedimento. **Método:** estudo descritivo, quantitativo, realizado entre outubro de 2018 e janeiro de 2019, em uma unidade de terapia intensiva neonatal no Noroeste do Paraná, por meio da observação não participantes de 192 punções arteriais, com respectiva mensuração dos escores de dor. O estudo foi aprovado pelo Comitê de Ética em Pesquisa com Seres Humanos. **Resultados:** das 192 punções somente 34 foram analisadas quanto às medidas de alívio e escores de dor, os quais se mostraram elevados. As demais punções foram excluídas, devido perda da monitorização durante o procedimento. **Conclusão:** evidenciou-se pouco uso de intervenções relacionadas ao alívio da dor por parte da equipe. O processo de observação constatou a presença de dor intensa.

Descritores: Cuidados de Enfermagem; Enfermagem Neonatal; Manejo da Dor; Observação.

RESUMEN

Objetivo: describir las medidas de alivio del dolor aplicadas por el equipo de enfermería durante la punción arterial en neonatos y las escalas de puntuación de dolor en el momento del procedimiento. **Método:** estudio descriptivo, cuantitativo, realizado entre octubre de 2018 y enero de 2019, en una unidad de cuidados intensivos neonatales del noroeste de Paraná, mediante observación no participante de 192 punciones arteriales, con medición respectiva de puntuaciones de dolor. El estudio fue aprobado por el Comité de Ética para la Investigación con Seres Humanos. **Resultados:** de las 192 punciones, solo 34 fueron analizadas en cuanto a las medidas de alivio y puntuaciones de dolor que fueron elevadas. Se excluyeron las otras punciones debido a la pérdida del monitoreo durante el procedimiento. **Conclusión:** el equipo utilizó poco las intervenciones relacionadas con el alivio del dolor. El proceso de observación verificó la presencia de dolor intenso.

Descriptores: Atención de Enfermería; Enfermería Neonatal; El Manejo del Dolor; Observación.

INTRODUCTION

Adequate pain control in newborns (NBs) admitted to Neonatal Intensive Care Units (NICUs) represents a challenge within the care practice. Despite the knowledge about the infant's ability to process the nociceptive stimulus, most procedures, which are often painful, are still performed without adequate control[1].

When not treated at an early stage of life, negative experiences such as those underwent by premature newborns (PTNBs) can cause several damages to brain development and, in the future, to social behavior, with short- and long-term consequences[2].

Considering the particularities inherent to newborns, such as long hospitalization periods and the large number of interventions to which they are subjected, studies on pain and its repercussions still draw the attention, mainly given the observation that infants cannot verbalize their pain[3].

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One of the most common procedures in which infants in this hospitalization condition are subjected to is that of punctures. These interventions are an essential practice in neonatal care, with venous punctures associated with the main drug administration route, parenteral nutrition and blood products, and arterial punctures linked to hematologic and oxygenation control[4].

Even though punctures and other painful procedures are necessary for this infant to survive, strategies minimizing these problems should be prioritized, as well as adequate planning and control of the management of neonates and their pain. It is necessary to safeguard the NBs from interventions whose benefits do not exceed the negative impacts inherent to the procedures[5].

It is understood that there are several difficulties permeating the care practice of nurses working in NICUs, such as work overload, deficit of employees, lack of institutional support and of time to seek scientific knowledge, added to the infant's own singularity; however, it is up to them and the Nursing team to provide adequate and humanized care, meeting the needs of this population in an integral way and in line with a scale of priorities[6].

Therefore, based on the above, the objective was to describe the pain relief measures applied by the Nursing team during arterial punctures in neonates and the pain scores at the time of the procedure.

METHOD

This is a descriptive study with a quantitative approach carried out in the NICU of a private hospital in northwestern Paraná, according to the recommendations set forth in the STROBE instrument for observational studies, recommended by the *Equator* Network. The unit under study serves patients coming from the Unified Health System, and provides care to NBs and children up to 11 years and 29 days old. It has 12 Intensive Unit beds and three beds outside the NICU, in a ward room, which comprise the Semi-Intensive Unit.

To define the sample, intentional non-probabilistic sampling was used, in which the researcher intentionally defined which punctures would be part of the study according to the previously determined inclusion and exclusion criteria. The infants included were those with a gestational age between 30 and 41 weeks at the time of collection (considering that, below 30 weeks, the probability of the infant being under mechanical ventilation would be higher and this reason was selected as exclusion criterion), with a minimum time since admission to the unit of six hours and who underwent arterial blood punctures. The minimum time since admission was determined due to the fact that the hospitalization moment is a known critical period, in which several procedures are carried out to stabilize the infant. We also focused on not impairing and/or altering the team's routine; therefore, it was considered that a good moment to start the observation would be after six hours.

Calculation of the pain score was performed only in the first puncture attempt since, in later attempts, it tends to increase, due to the stress and discomfort felt and expressed by the infant. In relation to the exclusion criteria, it was determined that infants on mechanical ventilation or in the postoperative period would be excluded, as the vast majority were already under continuous sedation and/or analgesia and this fact could interfere with or mask their pain expression.

A priori, a pilot stage lasting approximately 20 days was carried out, consisting of a non-participant observation period in the infants' arterial blood collection, during the morning period since, in the unit in question, the exam collection routine takes place preferably at this time. This period was also devoted to desensitizing the team in relation to the presence of the researcher. She went to the unit and stayed for a minimum period of one hour, in order for the professionals to get used to her presence and continue performing the usual and daily care.

The researcher had no connection with the unit and, at the time of the collection phase, the professionals in the sector, including the Medical, Nursing and Physiotherapy teams, had no knowledge about the specific object that was the observation target, thus avoiding conduction biases. The exam collections were preferably performed by the nurse and physician on duty or pediatric resident physician. In some situations, the nursing technicians assisted with collection, aspirating the blood syringe, or offering some pain relief measure to the infant.

The observations were conducted from Monday to Friday, with a mean of 12 arterial exam collections per week. On some days, there were collections in all hospitalized patients, while on others, no infant was manipulated for the examination. There was a total of 192 arterial punctures. Of these, there were 158 losses, which included accidental removal of the monitoring sensor during the procedure, a fact that made it impossible to quantify the pain score, intubated and sedated infants, children belonging to the pediatric age group and infants outside the previously determined gestational age. The figure below shows the data collection systematic scheme, which culminated in the final sample of 34 punctures:

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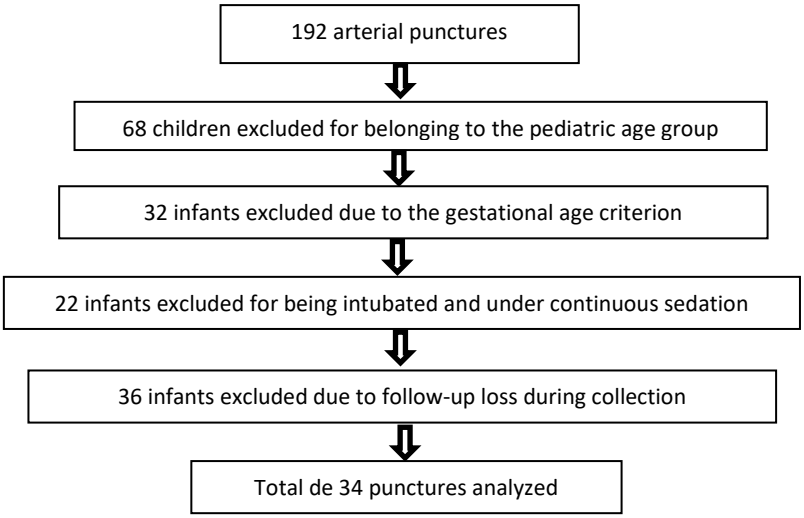

FIGURE 1: Final sample of the arterial punctures included in the study. Maringá, PR, Brazil, 2019.
Source: The author (2019).

The complete observation period lasted approximately four months, starting in October 2018 and ending in January 2019. During non-participant observation, the Premature Infant Pain Profile (PIPP) scale was applied[7]. Use of the scale depends on monitoring the infant via a pulse oximeter, in which heart rate and oxygen saturation are observed throughout the process, a fact that led to important losses, due to accidental removal of the sensor as a result of excessive NB movement during collection. In these cases, the data were automatically excluded. In order to ensure reliability of the pain score verified, the infant was observed for 15 and 30 seconds before and after the procedure, respectively.

Each parameter of the scale can be scored from zero to three points which, when added up at the end of the evaluation, provide the final score. The items observed are as follows: gestational age, infant's state of alert, heart rate, oxygen saturation and facial expression. The maximum score for premature NBs with a gestational age of less than 28 weeks is 21; with a gestational age from 28 to 31 weeks and 6 days, it is 20; with 32 to 35 weeks and 6 days, it is 20; and for infants with 36 weeks or more, it is 18. Absence of pain or presence of minimal pain is considered when the scores are less than or equal to six, and moderate to severe pain, when they reach values above 12. Values between seven and 11 can also be considered as moderate or intense pain[8].

The data from the observation period were analyzed using descriptive statistics and explained in a table consisting of the main pain relief measures applied by the professionals during the procedure. The pain scores were calculated according to the guideline recommended by the PIPP scale[7] and are described in the text body. In addition to the score during the puncture, the infants were characterized by gender, gestational age at the collection moment, main diagnoses, ventilatory support and number of punctures performed during collection. The study was approved by the Committee of Ethics in Research with Human Beings and all the ethical precepts set forth in Resolution 466/2012 of the National Health Council were contemplated.

RESULTS

The 34 infants that were subjected to arterial punctures and, consequently, included in the study, had from 32 weeks and 3 days to 39 weeks of gestational age. The most frequent diagnoses included the following: early respiratory distress, transient tachypnea of the newborn, early jaundice, early sepsis, late sepsis, pneumonia, grade I intracranial hemorrhage, grade II intracranial hemorrhage, pneumothorax, and intrauterine growth restriction.

In relation to birth weight, it varied between 1,980 g and 3,690 g, Cesarean section prevailed as the delivery type, and 58% of the infants were male. Regarding use of ventilatory support, 22% were using positive pressure in the upper airway (CPAP), 48% were using oxygen in the incubator and the remainder, 30%, in room air.

In 72% of the cases, more than one puncture was necessary to obtain the blood sample. As previously defined, the pain score was only calculated in the first attempt. The pain scores found varied between six, indicating slight or minimum pain, and 17, indicating moderate to intense pain.

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The relief measures used to mitigate pain during the punctures are described in Table 1.

TABLE 1: Pain relief methods observed during the arterial punctures. Maringá, Paraná, Brazil, 2019.

Measures applied during the punctures	Yes		No	
	AF*	RF† (%)	AF*	RF† (%)
Non-nutritive sucking	20	83	14	17
Use of oral glucose	12	35	22	65
Containment or winding	3	9	31	91

Source: The authors (2019).
Notes: AF*: Absolute Frequency; RF†: Relative Frequency.

It worth noting that the relief measures were not applied together. Each of them was carried out by the team individually, that is, either non-nutritive sucking was offered, the infant received glucose orally, or it was wound. Although it was not the ideal outcome, it was verified that, at times, the team seemed to be sensitized to the infant's discomfort and some relief measure was applied; however, in most cases, the procedure was performed in an automated and routine way, and this fact exerted a direct impact on the infant's general condition and on the pain score presented.

DISCUSSION

It was observed that the team also resorted to some care actions during the painful procedure, although it is worth remembering that, in many situations, they took place when the process was already in progress, due to the agitation presented by the infant, which hindered collection. The situations in which the moment was planned from beginning to end were uncommon, with application of a relief method prior to the puncture and with adequate return of the infant to its baseline status. As already found in other studies, this misalignment between the pain stimulus and the intervention was noteworthy[6].

Non-pharmacological strategies are low-cost and easy to assimilate and apply, and their implementation does not usually imply any type of risk or complication. They can be applied in isolation; however, a better outcome is achieved when one or more measures are combined, as they can have a synergistic and protective effect, for example, when non-nutritive sucking is used together with oral glucose supply, or grouped with containment or winding. Although not directly linked to pain control, containment favors psychomotor organization, acting on pain modulation, inhibiting the release of neurotransmitters responsible for exacerbating painful stimuli[9].

The moments preceding the procedures require special attention and exert significant repercussions on their outcomes and success. Usually, when the intervention starts, the lights are turned on, the noises increase and excessive manipulation takes place, taking the infant out of its state of comfort and organization, a fact that enhances painful stimuli. When there is planning before and not during the action, better results are observed in relation to the response presented by the hospitalized NB[10].

In this regard, every intervention to be carried out in these patients should necessarily be through organization of the entire process that precedes it and not focused only on the action itself, as acute painful stimuli in the NB trigger a global stress response, including cardiovascular, respiratory, immunological, hormonal and behavioral changes. The physiological responses are accompanied by endocrine and metabolic reactions, and can also generate hyperglycemia, increase protein-lipid catabolism and directly interfere with homeostasis of the PTNB, which is already precarious[11].

The anatomical substrates and structures for the perception and transmission of painful stimuli are extremely well developed in the neonatal population[12]. Fetal stress responses to invasive procedures are found at the 23rd week of gestational age and, by the 24th week, all the neurological structures necessary for nociception are developed, a fact that proves the need to apply non-pharmacological pain relief measures in order to alleviate the discomfort resulting from the hospitalization period[13].

The recommended time to offer the sweetened solution prior to the procedures is two minutes; therefore, it can be stated that the team that works directly with this infant would be able to organize their practice in order to include this action within their care routine. When offered in these conditions and associated with the provision of non-nutritive sucking, it promotes relief and comfort in the NB, reducing painful stimuli[14].

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In the cases related to unsuccessful puncture in the first attempt (72% of the cases), the infant's time must be respected and the team should wait for the baby to return to its baseline status Most of the time, the professionals can even identify more intense characteristics of discomfort presented by the infant, such as crying and agitation; however, it is worth remembering that opening the fingers, looking away and yawning are also signals emitted given the manipulation stress, and such situation should be considered as a warning sign, in the sense that the infant is not yet fully ready to undergo the intervention again[5].

Both in the unit under study and in other places, use of these measures is still not fully implemented. It can be asserted that this is not done due to lack of knowledge or, in other circumstances, to avoid changing the routine of the service, for example. We discovered that the pain scores found presented a significant variation and attained thresholds characterized as moderate to intense. It can be assumed that this finding reflects the lack of care systematization associated with the lack of knowledge about the importance and management of pain in NICUs. It is known that care planning takes more time than doing it automatically; however, when care is the result of a process of prior reflection, and is performed in an individualized and organized manner with a focus on the NB's global well-being, their outcomes are undeniably better[15].

Study limitations

The following stand out as limitations: the large number of losses during data collection and the difficulty carrying out the observation without the team realizing that the arterial puncture was the study object of interest. However, free of conduction bias, it was possible to detect failures in performance of the procedure, in accordance with what happens in the daily care provided in the service.

CONCLUSION

Considering the study objective and the results found, it was concluded that the application of non-pharmacological pain relief methods during arterial puncture is still flawed, a fact that was reflected in the pain scores presented by the infants during the procedure, added to the need for a new puncture, consequently potentiating the pain stimulus and exposing the NB to more manipulation.

It is understood that the results found reflect a local reality and that they cannot be generalized, as they can be presented in different ways if the study is replicated in other institutions with different care profiles.

It is noted that the study may come to support further research with regard to pain management in Neonatology, as it specifically proves the pain stimuli expressed by hospitalized neonates during a highly common and routine procedure such as arterial punctures.

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