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Expression of pain after physiotherapy care in premature newborns: observational study

Expressão de dor após atendimento de fisioterapia em recém-nascidos prematuros: estudo observacional

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RESUMO | INTRODUÇÃO: Atendimento fisioterapêutico a neonatos prematuros é rotina nas unidades de terapia intensiva neonatais. O questionamento se o manuseio em prematuros extremos e moderados provoca dor é norteador deste estudo. **OBJETIVO:** Avaliar a presença de dor em recém-nascidos prematuros após a realização de manobras fisioterapêuticas. **MÉTODO:** Estudo observacional realizado em recém-nascidos prematuros extremos e moderados durante a primeira semana de vida, com necessidade clínica de fisioterapia respiratória. Os recém-nascidos recebiam as manobras posicionados no ninho feito com cueiros dobrados. Imediatamente após as manobras de desobstrução pulmonar e antes da aspiração das vias aéreas foram aplicadas as escalas *Neonatal Infant Pain Scale* (NIPS) e *Premature Infant Pain Profile* (PIPP) e anotados os dados vitais. Trabalho aprovado pelo comitê de ética da instituição sob o número 706.623. **RESULTADOS:** Foram avaliados 50 atendimentos fisioterapêuticos em 22 recém-nascidos na primeira semana de vida. Estavam em ventilação mecânica invasiva 18 (36%), em *Continuous Positive Airway Pressure* (CPAP) 24 (48%), Cateter nasal 6 (12%) e sem suporte de oxigênio 2 (4%). Os mesmos mantiveram os dados vitais dentro dos limites de normalidade e somente dois prematuros cursaram com escore positivo para dor. **CONCLUSÃO:** Manobras de fisioterapia respiratória são suaves para não causarem dor. Porém é importante estar sempre atento aos sinais e oferecer atendimento humanizado ao prematuro para minimizar efeitos nocivos do internamento.

PALAVRAS-CHAVE: Modalidades de fisioterapia. UTI neonatal. Prematuros. Dor.

ABSTRACT | INTRODUCTION: Physiotherapeutic care for preterm infants is routine in neonatal intensive care units and the question of whether the management in extreme and moderate preterm infants causes pain is the guideline of this study. **OBJECTIVE:** To evaluate the presence of pain in preterm newborns after physiotherapeutic maneuvers. **METHODS:** Observational study made in extreme and moderate premature newborns during the first week of life, with clinical need of respiratory physiotherapy. The newborns received maneuvers while positioned in nests made with folded cloths. Immediately after pulmonary unobstruction maneuver and before the suction of airways, pain was measured through the scales Neonatal Infant Pain Scale (NIPS) e Premature Infant Pain Profile (PIPP) and vital signs were recorded Study approved by the university's ethics committee under the registration number 706.623. **RESULTS:** 50 physiotherapeutic appointments were evaluated in 22 newborns in the first week of life. From the data collected, 18 (36%) were in mecanic ventilation, 24 (48%) in Continuous Positive Airway Pressure, 6 (12%) in nasal catheter and 2 (4%) without oxygen support. The newborns kept the vital data within normal limits and only two preterm infants had a positive pain score. **CONCLUSION:** Maneuvers are gentle in order to not cause pain. Either way, it is important to always be alert for signs and offer humanized care to the premature, so that the harmful effects of hospitalization are minimized.

KEYWORDS: Physical therapy modalities. Intensive Care Units. Premature. Pain.

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Introduction

Part of the neonatal care strategies in Neonatal Intensive Care Units (NICU) is the attention and care of physiotherapists to newborns up to 28 days of life. This professional is responsible for the evaluation, prevention, respiratory treatment with bronchial hygiene, lung reexpansion maneuvers and sensory-motor stimulation. Physiotherapists also act in multidisciplinary staff in the application of medicinal gases, invasive and non-invasive mechanical ventilation, weaning and extubation[1,2].

However, due to neurological protection, there is restriction to the management of newborns with a gestational age of less than 32 weeks in their first 72 hours of life, avoiding variations in cerebral blood flow and preventing peri-intraventricular hemorrhages[3]. The premature presents some specific characteristics, such as: chest with greater complacency, rectified ribs and decrease in the area of juxtaposition between the ribs and the diaphragm; The intercostal muscles are ineffective in this phase, providing greater instability in the rib cage. In this way, the maneuvers performed by the physiotherapist must be chosen with care and executed with skill[4].

One of the objectives of neonatal physiotherapy treatment consists of the removal of bronchial secretions to maintain the patency of the airways, allowing the maintenance and even gain of lung volumes, with consequent optimization of gaseous exchanges and reduction of respiratory work[5,6]. The bronchial hygiene maneuvers or clearing maneuvers favor the displacement of secretions raising it towards more external regions of the lungs by means of increasing of expiratory flow, promoting cough and displacing secretions[6,7]. When the cough is inefficient or in presence of an endotracheal tube, the aspiration of secretions becomes necessary and the process of removal of the mobilized secretions is completed[8,9].

Assessing pain in the premature newborn becomes a great challenge, since the newborn is unable to verbalize his pain, but this fact does not indicate there is no pain. The international association for the study of pain defines pain as "an unpleasant sensory and emotional experience associated with damage to real or potential tissues". This definition requires the patient to describe their pain, and although it is widely accepted, it lacks applicability for non-verbal populations, mainly when ventilated mechanically and with a limited behavioral repertoire[10].

It is known that the benefits of physiotherapeutic intervention in newborns have an important role in the prevention and resolution of problems of respiratory origin. The team's concern in evaluating which procedures cause pain to the premature newborn led the present study, which aimed to evaluate the presence of pain in extreme and moderate premature infants after performing physiotherapeutic maneuvers through the application of physiotherapeutic maneuvers two different pain scales, the Neonatal Infant Pain Scale (NIPS) and the Premature Infant Pain Profile (PIPP).

Method

This is an observational study conducted in the NICU of a hospital of a public university from March 2014 to May 2015. The research was approved by the Ethics Committee of the participating institution in the study, CAAE 19182613.5.00.00.0096.

For the realization of the investigation, the Informed Consent Document was applied according to the Resolution n° 466 of 12/12/2012 (Conselho Nacional de Saúde do Brasil).

In the study, were included newborns who obeyed the following inclusion criteria: being born in the obstetric center of the participating hospital and staying in the NICU of the aforementioned hospital, having gestational age of 24 to 32 weeks within the second and seventh day of life, having an indication for respiratory physiotherapy care and having a signature of the informed consent document by the parents.

Exclusion criteria were considered for newborns who presented the following characteristics: presence of genetic syndromes, neurological disorders, congenital malformation of the head, neck or central nervous system, pulmonary hypertension, severely ill patients using inotropic medication, external transfer before the first data collection and deaths before the first data collection or impossibility of collection.

The preterm newborns participating in the survey received daily physiotherapy attentions, by the same investigator, after at least one hour and thirty minutes without receiving other pangs by the team. For the physiotherapy session carried out in the morning period, the patients were placed in the dorsal decubitus position in the nest, according to the care standard of the unit. Physiotherapy attention in this investigation had an average time of 15 minutes, counted from the moment in which pulmonary auscultation was first performed until the end of the maneuvers.

The premature newborns underwent clinical evaluation by the unit's doctor and after the indication, they were evaluated and attended only by the researcher, through clear respiratory physiotherapy maneuvers. The maneuvers used were: chest compression/decompression with stabilization of the thoracic cage and vibrocompression. All maneuvers were performed gently, taking into account the high compliance of the rib cage[2,15].

There was no control of other painful events that the newborn received, since they depended on the clinical need, but all were placed in the nest according to the positioning pattern of the unit (Figure 1). The application of pain scales was dependent on the evaluation group, without a gold standard for comparison.

Figure 1. Positioning in the nest

Source: The author (2019).

Training was carried out with the team of physiotherapists, nurses and nursing technicians in a presentation format, to recognize signs of pain in premature newborns and use of the Nips and Pipp[11] pain scales. One physiotherapist and ten nursing technicians participated as assessors of the scores. This evaluation was done immediately after the physiotherapy and before aspiration of the airways. The same procedure was repeated in all the participants of the investigation.

The therapeutic response was evaluated by means of the Nips and Pipp pain scores. The NIPS scale varies from 0 to 7 points and considers pain from 4 points[12]. For statistical analysis, the results for the presence of pain were considered when they scored four points or more and for absence of pain, when they scored up to three points.

The PIPP score is the only multidimensional pain scale that includes gestational age, where newborns with less than 28 weeks score more[13]. Variable from zero to 21 points, scores equal to or greater than seven points indicate the presence of pain, and above 12 points indicate moderate to intense pain[14]. For statistical purposes, it was considered absence of pain up to six points and presence of pain equal to or greater than seven points.

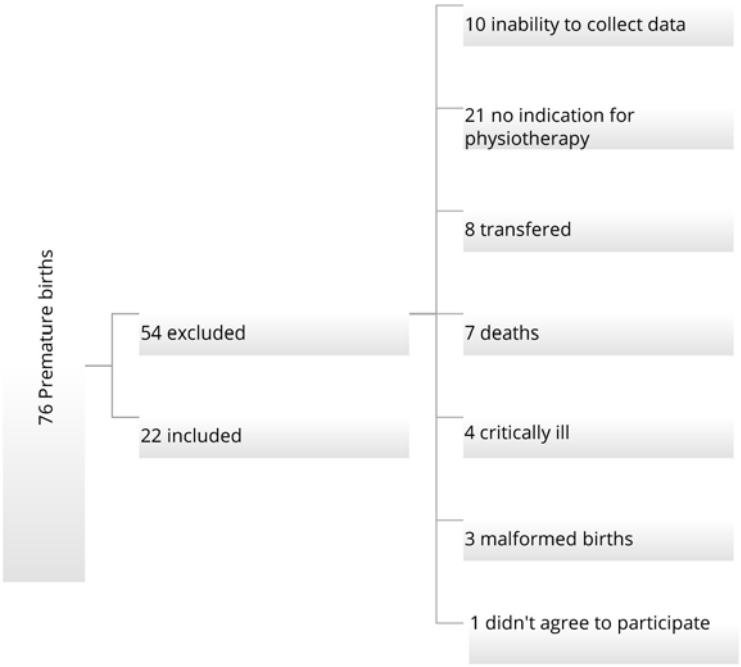
It was registered in the collection instrument, data referring to the profile of the newborn, such as: sex, gestational age and weight. Immediately after the physiotherapeutic maneuvers, the physiological parameters were recorded: respiratory rate, heart rate, peripheral oxygen saturation by pulse oximetry and pain assessment by the NIPS and PIPP scores. Subsequently, the data was typed in Microsoft Excel® spreadsheet, conferred and exported for statistical software Statistic Statsoft®, owned by the Postgraduate Program in Child and Adolescent Health, for data analysis.

Descriptive statistics was performed, with measures of central tendency and dispersion for continuous variables and absolute and relative frequency for categorical variables. The sample calculation was estimated considering the level of significance of 5%.

Results

In the data collection period, 76 preterm infants with less than 32 weeks of gestational age were born and 22 preterm infants were included by convenience sampling, according to the flow diagram in Figure 2.

Figure 2. Participant selection flow diagram



Newborns participating in the study received one to five procedures of respiratory physiotherapy during the first week of life, totaling 50 interventions, which resulted in the collection of data from 50 events.

As characteristics, the sample studied was 12 (55%) belonging to the male sex, they had an average gestational age of 28.4 weeks (± 2.34). The birth weight had a median of 1025.45 grams varying from 510.0 to 2230.0 grams, divided into three categories, being 11 (50%) up to 1000 grams, 6 (27.3%) between 1001 and 1500 grams, and 5 (22.7%) above 1501 grams.

Regarding the modality of ventilatory support, 24 (48%) newborns received CPAP, 18 (36%) invasive mechanical ventilation, 6 (12%) nasal catheter and 2 (4%) without any oxygen support cases.

Two newborns scored pain, these events were recorded at different times, one by the NIPS scale and the other by the PIPP. The detailed data regarding the presence of pain after physiotherapy attention are presented in Table 1.

Table 1. Characteristics of the sample with positive score for pain

Punctuation	Gender	WEIHT	GA	CA	IMV	RR	HR	P02
NIPS 5	F	765g	27	3	YES	88	179	94
PIPP 8	M	660g	25	6	YES	48	154	99

Source: The author, 2016.
Label: F: female; M: male; GA: gestational age; g: grams; CA: chronological age; IMV: invasive mechanical ventilation; RR: respiratory rate; HR: heart rate; PO2: peripheral oxygen saturation.

The evaluation of the vital data was carried out by the researcher immediately at the end of the physiotherapeutic maneuvers. The respiratory rate presented an average of 50.2 (± 15,9), the heart rate had a mean of 150,6 (± 17,7), and the transcutaneous oxygen saturation had an average of 95.2 (± 5, 6).

Discussion

The aim of this study was to evaluate the presence of pain in extreme and moderate premature infants after performing physiotherapeutic maneuvers, through the application of two different pain scales, the Neonatal Infant Pain Scale (NIPS) and the Premature Infant Pain Profile (PIPP). In 50 cases evaluated, two events that scored positive for pain occurred. One for the NIPS scale and one for the PIPP scale. These events occurred in different patients. Discussing, questioning and investigating whether respiratory physiotherapy causes pain in newborns is extremely important, considering that pain directly influences the clinical stability of premature infants. It is important to have the knowledge of which procedures generate pain, so that they are avoided or whenever they are necessary, to be applied together with some form of analgesia.

As described, the evaluation of the pain occurred immediately before the aspiration, that is, at the end of the execution of the clear thoracic maneuvers where only two premature patients undergoing physiotherapeutic care scored pain. The results agree with another study in which mechanically ventilated neonates under 34 weeks of gestational age under 1500 grams who were not under sedation or analgesia were evaluated. In the case of vibration techniques, they applied the NIPS before the attention, after the maneuvers and after the aspiration and found no pain after the maneuvers, the pain appeared after the aspiration procedure, corroborating with the findings in the present study[16].

In the study with similar physiotherapy time, pain was assessed by the Neonatal Facial Coding System (NFCS) scale during the treatment with vibrocompression maneuver in thirteen newborns with mean 32 weeks of gestational age. The pain and vital signs were evaluated before, during, immediately after the attention and 30 minutes after the term. The newborns underwent more or less 60 procedures / day before being included in the study. There was no indication of pain due to the scale used or significant changes in the physiological variables evaluated[17].

In an evaluation by another author, 60 term infants were separated by gender and randomized to receive one of the respiratory physiotherapy maneuvers, either manual diaphragmatic stimulation or manual thoracic vibrocompression. Pain was evaluated by means of two scales: NIPS and NFCS, before and after the procedure. The pain scores evaluated were superior to the moment that preceded the physiotherapy, for NIPS the number of neonates with pain was higher during the vibrocompression, even though there were no differences by the analysis of the NFCS. The two scales showed that newborns of the male gender presented pain during vibrocompression, while females did not show pain, concluding that the vibrocompression triggered a greater painful response in the neonates, especially in the male gender[18].

The vibrocompression maneuver, also used in the present study, is characterized by a pressure on the chest of the newborn and the involvement of isometric contractions of muscles of the forearm,

which transmits a greater stimulus to the thorax by the hand of the therapist. The intensity between each applicator in different studies cannot be measured, being important attention and humanization in the care and application of the technique[18].

In the present study there were two cases with positive pain score after the maneuvers, in different newborns, one occurrence evaluated by the NIPS scale and one by the PIPP scale. Both had similar gestational age and weight, but one was a male and the other was a female. The maneuvers were applied only by the researcher, but the pain evaluation was made by different professionals. The scales are dependent on the affinity of the evaluator with the scale, and there is no gold standard in the assessment of pain. The difficulty in perceiving the presence of pain occurs in the low-weight population, who present weak motor responses, making it difficult to see responses from the evaluation team[13]. Despite awareness of pain management in neonatal units, premature infants are subjected to innumerable procedures per day, and many of them are painful, expose them to stress and pain has been associated with long-term effects in that child's life. It is known that the threshold and tolerance to pain in survivors of NICU is lower. And inadequate pain management has been identified as a risk factor for the development of chronic pain in newborns[19].

In a review of non-pharmacological measures for pain control there is a description of the use facilitated tucking newborns to minimize the occurrence of pain. In addition to not having records of intercurrences when using the facilitated tucking, some of the studies positively report the use of a combination of methods, such as the use of non-nutritive suction. For these authors, it is also important to evaluate the pain before a potentially painful procedure, and using the strands would help the baby to regulate his response to pain and make him feel safe[20]. In the routine of the service where the research was conducted, all newborns are placed in the nest format in order to maintain proper positioning in flexing posture, minimizing stress during procedures.

The maneuvers of respiratory physiotherapy are not invasive procedures, but because the sensitivity to pain is individual, it is probably dependent on the number of exposures to painful and stressful procedures to which the neonate is subjected during their hospitalization. The act of evaluating pain and proposing non-pharmacological measures whenever necessary protects newborns and humanizes treatment.

Conclusion

Physiotherapeutic care for premature newborns is routine and, in addition to adequate techniques, offering comfort in real time minimizes deleterious effects in the short and long term. One limitation we had was the little control over the other painful procedures during the admission of the newborn. Another limitation was due to work scales that made it impossible for the same evaluator to have all the cases collected.

The study found that only two participants and in two cases collected presented a positive score for pain after respiratory physiotherapy maneuvers. Being attentive to signs of discomfort and pain humanizes the attention offered.

Author contributions

All the authors were responsible for the conception and design of the study, statistical analysis, critical revision of the text and final approval. Andreazza MG, Gomes EO, Cat ML, Da Silva RPGVC, they were responsible for the analysis and interpretation of the data.

Conflicts of interest

No financial, legal or political conflict involving third parties (government, private companies and foundations, etc.) was declared for any aspect of the work submitted (including but not limited to grants and financing, participation in advisory council, study design, preparation of manuscript, statistical analysis, etc.).

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