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RESEARCH ARTICLE

MINIMAL HANDLING PROTOCOL: TRANSDISCIPLINARITY IN PREMATURE NEWBORN NEUROPROTECTION IN THE BRAZILIAN AMAZON

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ABSTRACT

Prematurity leads to admission to the Neonatal Intensive Care Unit (NICU), an essential environment for higher survival rates, but which can cause neurodevelopment problems. Thus, minimal handling protocols are needed for the neuroprotection. This study evaluates the transdisciplinary view of neuroprotection in premature newborn (PTN) in the NICU of a reference hospital in the Brazilian Amazon. A field study with a prospective, qualitative and quantitative approach was conducted in a sample of forty-three professionals from the NICU of the hospital. Data collection was performed through recorded interviews with a semi-structured questionnaire. The qualitative data was analyzed through Bardin's Theory and the quantitative data analyzed by software. Results showed prevalence of professionals with five to ten years of experience who had never had training on neuroprotection. Most defined neuroprotection as protection of neurological structures, the ideal interval for the handling of the PTN every 3 hours, and agreed that bathing, diaper changing, light and others influence the neuroprotection. Therefore, the team's reduced knowledge about neuroprotection can be detrimental to preterm care, having a direct impact on the child's healthy neurodevelopment. Minimal handling measures are crucial to reduce harm and it is urgent to carry out studies in the area.

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INTRODUCTION

According to the World Health Organization (WHO), prematurity is birth before 37 weeks of gestation are completed. The WHO divides prematurity into subcategories according to gestational age, with newborns of less than 28 weeks, considered to be extremely premature, 28 to 32 weeks classified as very premature and 32 to 37 weeks considered to be moderate or late premature (Marques *et al*., 2017). Prematurity leads to the need for hospitalization and specialized care, given its anatomical-physiological condition, weighing less than 2000g and gestational age less than 30 weeks. Due to their condition, the premature baby is exposed to a high sensory load and many stressful stimuli resulting from its handling in the Neonatal Intensive Care Unit (NICU), which include painful stimuli, noise and sleep interruption, factors that lead to tension-related imbalances physical and mental (Orsi *et al*., 2015; Marques *et al*., 2017).

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In these environments, conditions are very different from intrauterine life, as there is constant exposure to light, high noise levels and a large number of interventions contribute to deleterious effects in preterm newborns (PTN), due to the fact that their immature nervous system is unable to process excessive stimuli in a way efficient, which leads to loss of physiological stability and behavioral changes, which can lead to excessive pain, developmental problems and periventricular hemorrhage, causing implications in the short or long term (Orsi *et al*., 2017). In this context, the neuroprotection that describes the set of daily practices of the multidisciplinary team of the NICU that results in neuronal regeneration, recovery or preservation, of the structure and function of the nervous system, comprising all interventions that stimulate normal neurodevelopment, acts as a key point in reducing such sequelae (Blencowe *et al.,* 2013). In view of this reality, the minimum handling protocols aim to standardize the conduct of the multidisciplinary team, which enables neuroprotection by ensuring the least possible manipulations of the hospitalized PTN (Beleza & Chagas, 2018).

The care with the preterm newborns must recommend measures that prevent problems arising from the routine, and, in addition to the minimum handling, measures such as the reduction of sound and light levels, the maximization of rest periods and the distribution of group care must be included (Cabral & Veloso, 2014). The NICU of Altamira is the rear of urgency and emergency care, being the only one to have a Neonatal Intensive Care service with 5 beds, to serve the entire Xingu region with an occupancy rate of 98% of beds, in addition to the epidemiological profile of hospitalization be prematurity, sepsis and respiratory failure (PRÓ-SAÚDE, 2020). Health in Altamira, as a hub city in *Transamazônica*/Xingu region for 9 other municipalities, has historically been linked to problems related to the lack of structure, professionals and insufficient resources throughout countless historical processes that have impacted the region such as opening of the *Transamazônica* Highway and the construction of the *Belo Monte* Hydroelectric Power Plant, milestones that significantly influenced the inertia in improving the provision of local health (Sousa *et al.*, 2021). In this context, the objective of this study is to evaluate the transdisciplinary view on neuroprotection in the premature infant in the Neonatal Intensive Care Unit in a Reference Hospital in the Xingu Region, Northern Brazil.

METHODS

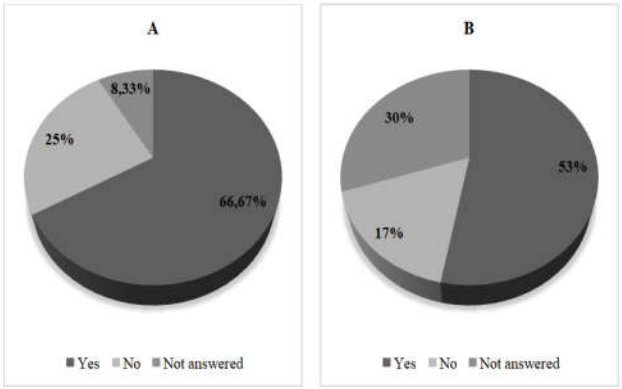
In this research, a field, prospective and with a qualitative and quantitative approach study was carried out. The sample consisted of forty-three professionals working in the health of high-risk premature newborns admitted to NICU of the Regional Public Hospital of *Transamazônica* (HRPT), composed of doctors, nurses, nursing technicians, physiotherapists, occupational therapists and speech therapists. The research had as inclusion criteria professionals who work directly with high-risk preterm infants who agreed to participate in the research by signing the Informed Consent Form. It is noteworthy that members on professional setting period, that is, with less than 45 days of experience in the NICU and those who were on leave or on vacation, were excluded. Data collection was carried out in September 2020, through a recorded interview, using a semi-structured questionnaire with open and closed questions to understand the team's view on neuroprotection and knowledge of good practices to the NICU under minimal handling, such as care routine and prevention of pain and stress. Remarkably, at the time of data collection, professionals had never been trained in neuroprotection. For qualitative data, the results of this study were analyzed according to Bardin's theory, which proposes content analysis. This analysis is a communication analysis technique that studies what was said in the interviews. In the analysis of the material, we seek to classify them in themes or categories that help in understanding (Bardin, 2010). In addition, according to Silva and Fossá (2015), the content analysis method comprises phases that include reading the collected material, coding for analysis, categorization, and progressive grouping of data, in addition to inference and interpretation, supported by the theoretical framework. For the tabulation of quantitative data, the software Microsoft Office Excel version 2010 and Microsoft Office Word version 2010 were used. And for the analysis and elaboration of graphs and graphs, we used descriptive statistics, a tool that uses synthesis measures such as percentages, indexes, and averages.

This research was submitted to the Research Ethics Committee of the Nucleus of Tropical Medicine of the Federal University of Pará, following the guidelines for research involving human beings of Resolution 466/2012 of the National Health Council, beginning only after approval - Protocol number 28962620.7.0000.5172, according to the Resolution of the National Health Council 196/96.

RESULTS

The study interviewed members of the neonatal intensive care unit team at the HRPT, a reference hospital in the region. Responses were collected individually by conducting a structured questionnaire with each member in the form of an interview. The team is composed of 43 members, of whom 36 were interviewed and 7 were excluded because they fit the exclusion criteria of the research. The results of the questions related to the composition of the team working in the NICU, the time experience in caring for the premature newborn, training on neuroprotection and its definition (categorized in three response profiles in Table 2) are shown in Table 1. When asked about the indication for handling of PTN and the intervals between handling, the most frequent responses were every 3 hours (n = 21) and every 6 hours in the extreme premature (n = 14), while the less frequent response was “not handling extreme premature infants” (n = 2). It is noteworthy that in this question more than one answer per interviewee was admitted. When asked if bathing would influence the premature’s neuroprotection, most answered yes (n = 25) and 2 did not answer. Regarding the indication for the beginning of the baths, the most frequent responses were PTN> 1,500g and PTN> 2,000g, both with (n = 8), PTN> 1,000 g and stable PTN, both with 5 mentions. Regarding the frequency of baths, the most cited were daily (n = 8), once a week (n = 8), unable to answer (n = 8) and twice a week (n = 7).

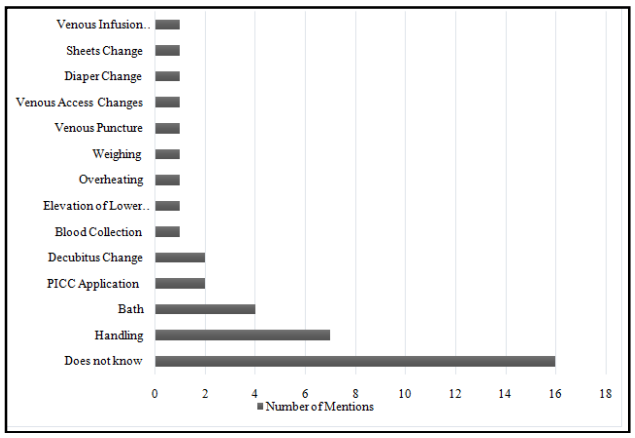
Regarding the influence of diapers change and sheets change on neuroprotection, the answers are shown in Graph 1. About the frequency of diapers change, the most common answers were: when necessary (n = 13); and every 3 hours (n = 12). In addition, they answered the question about the frequency of sheets change most commonly with: when it is necessary or there is dirt (n = 14); daily (n = 7); and with each bath (n = 6).



Source: The author from the data collected by the questionnaires applied in the NICU team of the reference hospital. A - answers about the diaper change. B - answers about the sheets change

Graph 1. Answers about the influence of diapers change and sheets change on neuroprotection in the preterm newborns

When weighing must begin, 24 of the respondents did not respond or did not know how to respond. Among those people who responded, the most common mention was "5 days after birth" (n = 2), "72 hours after birth" (n = 1); and "not weighing extremely premature infants" (n = 1). In addition, one interviewee mentioned that the routine should be based on the existence of a scale in each incubator. About the ideal weighing routine, 6 of the interviewees did not know how to answer or did not answer the questions. Among the answers, the most common were once a day (n = 11) and once a week (n = 7). Regarding the intervals between decubitus changes, positioning of the PTN and restrictions on handling in the first 72 hours, for the decubitus change the intervals of 3 in 3 hours (n = 25), 6 in 6 hours (n = 13) would be the most indicated or indicated in a less specific way that varies according to prescriptions or clinical condition (n = 9). It is worth noting that this questioning allowed free answers. Regarding the restrictions on changing positions in the first 72 hours, 24 people stated that there must be restrictions and 12 of them did not respond or did not know how to respond. The causes for the restriction were nonspecific for 19 interviewees and 2 cited the restriction only for extreme PTN, yet were mentioned, once each, indication of restrictions: according to medical prescription, in the PTN without respiratory problems and according to hemodynamic stability. Regarding which procedures would be harmful to the brain in the preterm newborns, the interviewees highlighted the handling (n = 10) and diapers change (n = 9). The following responses had only 1 mention each: "no procedure" and "all procedures". Regarding the procedures that must be avoided in the first 72 hours of preterm newborns, the answers are shown below in.



Graph 2. Procedures that must be avoided in the first 72 hours of the premature newborn according to the NICU team

Graph 2. Regarding the ideal position of the premature infant, 21 respondents did not answer or did not know, while other responses included: supine position; prone; do not prone. The question related to the measures to be taken during painful and stressful procedures admitted more than one answer, so different measures were cited, with the greatest number of mentions: medications (n = 15) and the pain protocol (n=4). Regarding the repercussions of luminosity on neuroprotection and the possible measures to be adopted, 34 interviewees indicated that luminosity has repercussions, and 2 interviewees did not know how to answer. Regarding the measures that were adopted, the most common responses were the practice of covering the incubators (n = 22) and lights off when there is no need to be on (n = 14).

Other interviewees mentioned: the use of low light, individualized light, and the use of glasses / eye patches. Regarding the influence of noise on neuroprotection and possible measures to be taken, all 36 respondents responded that there is influence. When asked about the measures to be adopted, noise reduction (n = 21) and "*momento psiu*" (routine silent moments) (n = 17) were the most cited. The question admitted more than one, other measures cited were: reducing the volume of alarms (n = 6) and not answering the phone at the NICU, (n=3).

DISCUSSION

The Multi professional Team and the Experience in the Care of Premature Newborns: The NICU team at the Regional Public Hospital of *Transamazônica* has a predominance of nursing technicians and nurses among the professionals participating in the research. Such pattern of composition of the multidisciplinary team of the NICU is recurrent in other neonatal units in the Brazilian territory, although there is a lower incidence of doctors in the team (8.33%) when compared to other similar studies in neonatal units of the Regional Hospital of the Southwest in Paraná (14.8%)and the Regional Hospital of Tucuruí (12,5%) (Moretto *et al*., 2019; de Oliveira Filho & da Mota Almeida, 2017). Regional differences in the unequal distribution of doctors and disparities in the composition of health teams with a greater concentration of health professionals in urban centers and a lack of doctors in certain regions, such as the Xingu region, is a recurring problem in Brazil (Dal Poz, 2013).

The majority of the study team had experience time varying between 5 to 10 years in the care of the premature, however, in relation to the training of the team regarding the neuroprotection of the premature newborn, 80.5% acknowledge never having received it. According to Carteaux *et al*. (2003) e Blencowe *et al*.[15] (2013) this training is essential not only for the well-being of preterm infants during hospitalization, but also for their quality of life in the post-discharge period, seeing that adequate conditions for neurological development in the first 72 hours of life are essential for them to be injuries, sequelae and delays in neurodevelopment are avoided, causing harm to the PTN's physical health, in addition to difficulties for his family, society and health systems (Carteaux *et al.*, 2003; Fleiss & Gressens, 2019). Considering the lack of specific training on PTN neuroprotection among team members, only 11.11% had full knowledge of the term. This can be harmful to premature infants, neuroprotective strategies are important members of care in the neonatal period for their improvement and harm reduction, despite the remarkable advances in the care and survival of premature infants, many neonates will have cognitive, behavioral and motor deficits throughout of life (Fleiss & Gressens, 2019).

Minimal Handling and Care of Premature Newborns: When relating the team's approach to the routine of handling the PTN with the Minimal Handling Program - FIOCRUZ / Instituto Fernandes for neuroprotection, a set of reference measures in neonatal care in Brazil, there is consonance of the response predominant with that recommended by the protocol, that is, handling at intervals of at least 3 hours, which was indicated as something ideal by 21 interviewees (58.3%) (IFF/FIOCRUZ, 2018).

Table 1. Answers to questions regarding the multidisciplinary team and the experience in the care of premature newborns

Questions	Answers	% (absolute number)
What is your occupation at the neonatal intensive care unit?	Doctor	8,33% (3)
	Nurse	25% (9)
	Nursing Technician	55,56% (20)
	Occupational Therapist	2,78% (1)
	Physiotherapist	5,56% (2)
	Speech Therapist	2,78% (1)
How much time of experience do you have at the care of premature infants?	< 1 year	16,67% (6)
	1 to 3 years	22,22% (8)
	3 to 5 years	22,22% (8)
	5 to 10 years	30,56% (11)
	> 10 years	8,33% (3)
Have you ever had any specific training in neuroprotection of premature babies?	Yes	5,56% (2)
	No	88,89% (32)
	The person did not answer	5,56% (2)
According to your knowledge, what does neuroprotection mean?	Protection of neurological parts	63,89% (23)
	Prevention of sequelae	5,56% (2)
	General protection of the newborn	11,11% (4)
	The person did not know how to answer	19,44% (7)

Source: The author from the data collected by the questionnaires applied in the NICU team of the reference hospital

Table 2. Profile of answers to question 6 "According to your knowledge, what does neuroprotection mean?

Profile 1 - Protection of neurological structures	Profile 2 - General protection of newborns	Profile 3 - Prevention of sequelae
E. 11 – "Protection of his little head, everything that involves inside, brain."	E. 18 – "Everything that encompasses the protection of the newborn"	E. 5 – "Prevention of sequelae."
E. 12 - "In my day-to-day: we cannot shake the child due to the vases that can break, this is the care that I understand"	E. 8 – "It means the neurological issue of the patient, understanding that the premature is still in the maturation process and that several external factors can influence his development."	E. 15 – "Neuroprotection would be the care that the whole team has to take so that that child does not have future neurological sequelae or at least mitigate these sequelae if they are possible to happen, seeing that the premature and very susceptible to having any type of injury, then it is trying to less mitigate the progression of these sequelae."
E. 25 – "Risk of bleeding, bleeding in the head because they are much more fragile. "	E. 17 – "I don't know, but I think it is more related to the protection of the child because he is born, but because he is premature, you have to be very careful, in this matter of protecting him, the bacterial flora and everything else."	E. 23 – "The care that is taken to premature newborns is considered to prevent neuropsychomotor disorders"

Source: The author from the data collected by the questionnaires applied in the NICU team of the reference hospital. E. = Interviewee

This knowledge is essential, seeing that among the problems resulting from manipulations with shorter intervals is the interruption of the sleep-wake cycle of the preterm newborns, which must be preserved, seeing that the premature baby's sleep is extremely important, considering that they are rest periods that allow you to mature and grow in a healthy way (Marques *et al*., 2019). Among the people who were interviewed, 10 professionals highlighted the need for minimal handling. Such perception is essential in neonatal units, seeing that it provides structured and individualized care to premature infants so that the problems arising from hospitalization are minimized, their stay in the NICU is no longer prolonged and the impacts on their neurodevelopment are reduced(Mosqueda *et al.*, 2013).

Besides, the team's responses about the impact of hygiene care (bathing, diapers change and sheets change) on care based on neuroprotection demonstrated that most of the team is aware of the harmful effects of this care according to the frequency that the procedures are performed and time of beginning of their respective routines, considering that they fit as procedures that can become excessive, which leads to a decrease in time in minimal handling (Magalhães *et al*., 2011). This conception is something fundamental to guarantee neuroprotection, taking in consideration that, like other manipulations for the performance of procedures that are most commonly considered painful, such as heel lance and the examination of retinopathy of prematurity, routine procedures for the prenatal hygiene are also active causes of pain and stress, which leads to increased production of stress-related hormones that are neurotoxic and therefore generate sequels and delays in neurodevelopment in the long run (Lyngstad *et al*., 2014; Padhi *et al*., 2015). As for the preterm newborn weighing routine, most of the team stated that the routine is to carry out the weighing every 24 hours, which differs from the recommendation of the Minimal Handling Protocol described by Monteiro *et al*. (2019) which determines that daily weighing must be avoided. The predominant understanding of the team states that there are restrictions related to the changes in decubitus in the first 72 hours. However, knowledge about the reason for these restrictions is vague, when analyzing that most of the team did not respond. Such a measure needs reinforcement so that the team understands its importance, because the interferences in the ideal positioning in these first hours of life affect the cerebral blood flow of newborns due to their inability to self-regulate cerebral perfusion, that is, they can cause brain injuries such as: intraventricular hemorrhage (Malusky & Donze, 2011). In addition, the team has low knowledge about the ideal position when considering that 21 of the 36 interviewees did not know how to answer. This finding is worrying since the adequate therapeutic position of the PTN during his period in the NICU directly influences the physiological functions such as the cerebral circulatory pattern and the neurobehavioral and motor development of the newborn (Xavier *et al.*, 2012).

Stressors in the Neonatal Intensive Care Unit: Regarding stressors, a significant part of the NICU professionals did not know which procedures should be avoided in the first 72 hours of life of the PTN. In this sense, minimum handling protocols specify procedures and care that must be avoided in the first 72 hours, in addition to ways to perform them, if it is necessary, with less damage to the premature's well-being (IFF/FIOCRUZ, 2018). Thus, the NICU team indicated, more frequently, the administration of medications, as a relief measure during these procedures. Such a measure may be problematic due to the evidence that the administration of opioid analgesics in the context of prematurity is associated with changes in the neurological development of the PTN, such as a greater propensity to the development of behavioral disorders, reduced cerebellar development and cerebellar hemorrhages (Zwicker *et al.,* 2016). There is a consensus among team members that noise influences the care based on neuroprotection, so that it can exceed the maximum acceptable level of 45 decibels, recommended by the American Academy of Pediatrics (Lasky & Williams, 2009). Noises lead to apnea, hypoxemia, alternation in oxygen saturation and increased secondary oxygen consumption, causing neurodevelopment problems. The harmful effects are not restricted to the premature, so that high levels of noise are associated with an increase in errors by the NICU team (Almadhoob & Ohlsson, 2015). The team understands the negative effects of excess light on neurological outcomes resulting from the interruption of the circadian cycle. Besides, due to premature birth or exposure of the neonate to darkness or bright continuous light, there may be negative impacts on long-term hospital stay, feeding, growth and neurodevelopment (Zores-Koenig *et al*., 2020).

CONCLUSION

During this study that was carried out, the team, although experienced, presented limited knowledge regarding neuroprotective care, which can expose newborns to risks. It is essential to implement a Minimal Handling Protocol and permanent education for the team to reduce damage to neurodevelopment. It must be noted that in the northern region of Brazil, studies on neuroprotection in NICUs are scarce and non-existent in the Xingu region. In this sense, studies aimed at understanding the care profile could provide substantial indicators, through epidemiological studies on health, well-being, and neurodevelopment in the post-discharge period of preterm infants treated in the Amazon.

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