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THE EFFECT OF HAMMOCK POSITIONING ON PAIN INTENSITY OF OROGASTRIC TUBE INSERTION AND PHYSIOLOGICAL PARAMETERS AMONG PREMATURE NEONATES

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Abstract

Background: Premature neonates are vulnerable humans requiring much care and attention. pain experience in the neonatal period leads to short- and long-term complications that could be prevented through neonatal pain relief. The hammock positioning within the incubators simulates the intrauterine environment, pain experienced in the neonatal period leads to short- and long-term complications that could be prevented through neonatal pain relief. Aim: To investigate the effect of hammock positioning on pain intensity of orogastric tube insertion and physiological parameters among premature neonates. Methods: Design: The researcher conducted a quasi-experimental research design at neonatal intensive care units at Sohag University Hospital. Sample: A purposive sample of 80 premature neonates was randomly divided into two groups: control and study, each with 40 premature neonates. Tools: The researcher collected the data through the neonatal characteristics assessment tool, neonates' physiological indices assessment tool, and Premature Infant Pain Profile. Results: The study revealed that 68% and 36% of the study group had mild and moderate pain, while 50% and 12% of the control group had moderate and severe pain from orogastric tube insertion. Also, hammock positioning was enhancing the stability of the preterm neonates' physiological parameters in the study group compared to the control group at a p-value of 0.005**. Conclusion: Hammock positioning significantly decreased the severity of pain compared to the control group. In addition, hammock positioning had a positive effect in

stabilizing the premature neonates' physiological parameters among premature neonates Recommendation: Hammock positioning should be a part of the routine care for all premature admitted to NICUs.

Keywords: Hammock positioning, pain intensity, physiological parameters, premature neonates.

Introduction

The nutrition of premature newborns is supported through orogastric tube feeding. Even though there are successful non-pharmacological ways to lessen the discomfort associated with orogastric tube insertion, there isn't much research that addresses it. No study has combined non-pharmacological treatments to lessen the discomfort associated with inserting an orogastric tube (Cirik & Efe, 2020).

Premature newborns are those born after gestations of less than 37 weeks (Wang et al., 2022). There is a global issue because the global rate of premature deliveries is about 11.1% and rising, and the World Health Organization forecasts that 15 million preterm neonates are delivered year (Huang et al., 2022 Costa et al., 2021). As they are exposed to light, noise, handling, and painful treatments while receiving care in the Neonatal Intensive Care Unit (NICU), preterm newborns (PTNB) admitted to the NICU may exhibit abnormalities in their neurobehavioral organization. This has the potential to result in physiological disarray, energy expenditure, hemodynamic instability, alterations in intracranial pressure, and central nervous system involvement (Jesus et al., 2018). To reduce the losses brought on by these stressors and to encourage comfort, behavioral techniques for posture and sensory stimulation are required in the NICU (Pereira et al., 2019).

Initiatives to humanize treatment in the NICU during the past 15 years have stressed the significance of this sort of strategy, emphasizing the technical quality of care, welcoming technologies, and support for patients and family members. The care for birthing and new babies has already adopted these innovations, which have been proposed in several disciplines. The kangaroo method, water immersion, music therapy, hammock placement, and humanized delivery stand out among these practices (Queiroz et al., 2017).

The term "hammock positioning" (Hp) refers to the placement of infants in an incubator in a tight-fitting, compact rectangle of fabric (hammock). For the therapeutic placement of babies, HP is an easy and affordable option. Even though nothing is known about HP, physical therapists have used this method in several NICUs. At the NICU, preterm infants are subjected to an uncomfortable environment and unpleasant procedures (Albuquerque &Albuquerque, 2017). Moreover, preterm infants with low birth weight have higher rates of morbidity and mortality as well as delayed motor growth. In addition to reducing postural abnormalities and asymmetries associated with prematurity and the NICU stay, proper therapeutic placement of the preterm can also promote the development of spontaneous and functional motor abilities in babies. According to studies, posture has a direct impact on the cardiovascular and respiratory systems (Queiroz et al., 2017).

Preterm containment, vestibular stimulation, sensory integration, tonic, and behavioral rearrangement are all goals of the Hp, which aims to lessen the harmful sensory stimuli that the developing brain is exposed to in the NICU. Hp may also induce relaxation, encourage the coordination of movements, imitate the intrauterine environment, and lessen the energy consumption of neonates with very low birth weights. 5 According to some research, the method helps patients feel less stressed while they're in the hospital, thus it might be viewed as a way to humanize NICU treatment (Jesus et al., 2018).

Premature hospitalization necessitates quick pain management since early pain exposure may have harmful effects. There are both drug-based and non-drug approaches to treating infant pain (Bucsea & Riddell, 2019). Pharmaceutical analgesia is known to have undesirable side effects and unpredictable early results. Treatment for non-pharmacological pain is efficient and soothing. Preventing developmental problems in premature infants requires these research and development techniques (Sadeghi et al., 2019).

Since painful procedures are routinely carried out on sick and preterm newborns and because the side effects of the medications given to them are worrisome, the emerging tendency is to adopt non-pharmacological pain-relieving therapy for these operations (Bueno et al., 2020). Preterm neonates are especially vulnerable to these effects since the painful injury takes place at the critical stage of brain development, potentially exposing them to long-term developmental and psychological disorders (Park & Im, 2020). Hence, pain treatment in preterm babies is a key concern in the neonatal critical care unit (NICU) (Obeidat & Aloweidi, 2021).
To competently care for preterm newborns and react to their cues rather than performing prescribed procedures, neonatal nurses must be well-versed in current knowledge and abilities. (2015) Mahmoodi et al. Also, neonatal nurses would do better to embrace evidence-based techniques that prioritize reducing the stress of the neonates while also encouraging their self-regulation and containment. Also, they are essential in enabling moms to take part in the care of their newborns. This will make it easier to switch from traditional developmental care to continuous developmental care gradually and smoothly (Kaya, 2017).

Significant of the study:

The NICU treats premature infants with a variety of invasive and frequently painful procedures. The long-term physiological and behavioral repercussions of traumatic surgeries are especially dangerous for premature infants (Sharma, 2021). The pain and tension experienced by preterm neonates can be reduced by non-pharmacological interventions such as aided tucking positions. Early diagnosis and treatment of pain in preterm babies are necessary. Premature neonates should be given painkillers and coping mechanisms that don't use drugs (Davari et al., 2019). Preterm delivery complications account for 38% of newborn deaths in Egypt (Hamad et al., 2022).

However, some HP-related outcomes, including vital signs, pain, behavioral status11, and motor development, are still debatable because most research methods are of low quality (Bezerra et al., 2014). Studies have also highlighted the dangers of apneas or desaturation during HP. Current analyses on this subject draw attention to the paucity of scientific evidence supporting HP's potential benefits and hazards. As a result, the goal of this study was to assess how Hp affected the behavioral states, pain, and vital signs of very low birth weight preterm infants (Bortoli AFC, Taglietti, 2015).

Aim of the study was:

To investigate the effect of hammock positioning on pain intensity of orogastric tube insertion and physiological parameters among premature neonates through:

- Assessing pain levels among premature neonates pre-hammock positioning.
- Assessing physiological parameters among premature neonates pre-hammock positioning.
- Evaluating the effect of hammock positioning on pain intensity of orogastric tube insertion and physiological parameters among premature neonates

Research hypothesis:

H1: Hammock positioning expected to reduce pain intensity of orogastric tube insertion among premature neonates

H2: Preterm neonates who receive hammock positioning exhibit more stable physiological parameters than those who receive Hammock positioning.

Design:

The researcher conducted a quasi-experimental research design to achieve the aim of this study.

Setting:

The study was conducted at neonatal intensive care units at Sohag University Hospital, which included 30 incubators and 15 mechanical ventilators divided into two rooms.

Subjects:

A purposive sample of 80 premature neonates was randomly divided into two groups: control and study, each with 40 premature neonates. The study group receives hammock positioning in addition to routine care and the control group received only routine care from the selected NICU as medication and examinations.

Sample size calculation:

The sample size was calculated using the Epi Info program version 10 and the following parameters: population size of 99, confidence interval of 97%, the expected frequency of 50%, and allowable error of 5%. 86 preterm newborns were the bare minimum sample size required. Hence, 90 preterm newborns were included in a purposeful sample for this investigation.

Inclusion criteria included:

- The children's carers approved of their participation.
- newborns were between 32 and 36 weeks of gestational age and between 0 and 28 days after delivery.

Exclusion criteria included:

Neonates having an intraventricular hemorrhage, pulmonary, cardiac, or neurological problems, recent use of sedatives or analgesics, or intraventricular attachment to a mechanical ventilator were eliminated.

Data Collection Tools

Tool I: Neonatal characteristics assessment tool as gender, gestational age, birth weight, and Apgar score.

Tool I: Neonates' Physiological Parameters Assessment Tool:

The researchers created this tool after reviewing pertinent literature to evaluate the physiological parameters of preterm neonates, such as temperature, heart rate (HR), oxygen saturation (SpO2), and respiratory rate (RR).

Tool III: Premature Infant Pain Profile (PIPP): The PIPP scale, which was adapted from Stevens et al. (1996), was used to evaluate pain using seven indicators, including two physiological (heart rate and oxygen saturation) and two environmental (gestational age and sleep/wake state) measures. The following pain signs were graded: sleep/wake state, forehead bulging, eye squeeze, nasolabial furrow "subtotal," gestational age, heart rate, and oxygen saturation. Depending on the infant's gestational age and sleep/wake status, each sign is given a pain score on a 4-point (0-3) scale; the total score can range from 0 to 21. premature babies' Pain Profile scores below six are thought to indicate at least mild pain, whereas scores above twelve are thought to indicate moderate to severe pain. If the subtotal score >0, add GA and BS indicators. Total score: Subtotal score + GA score + BS score. Internal consistency reliability (Cronbach's α) for PIPP emerged as “Excellent” 0.901.

Data collection method

Five professionals in the area of pediatric nursing evaluated the content validity of Tools II and III. To evaluate the precision, viability, and application of the research methods, a pilot study of 8 preterm newborns (10%) was carried out. As no modifications were made as a result, these neonates were included in the study's overall sample. The characteristics of the two groups of preterm newborns were gathered from their hospital records. Data from the study group and the control group were first collected (Hammock positioning).

Ethical Considerations

The review board of the Sohag University Faculty of Nursing's Ethical Research Committee gave its permission. The director of the aforementioned setting granted official approval for the study to be carried out. Premature newborns whose parents matched the study's eligibility requirements were fully informed of the study's objectives, and their written consent was acquired. The fact that all information gathered would be kept private was also disclosed to parents who agreed to their early participation. Also, they are permitted to freely and without any repercussions remove their premature newborns at any moment.

The following physiological parameters were assessed: A sensor placed on the outside of the neonate's foot measured the neonate's heart rate (HR) and oxygen saturation (SpO2) and recorded the data on a multiparametric monitor. The researchers measured the RR by counting the respiratory cycles per minute and visually examining the preterm neonate's chest. The researchers used a mercury temperature sensor to gauge body temperature at the axilla. The preterm neonates in the control group got standard NICU care, which includes wrapping the neonate in a fetal posture with a towel that has been folded up within the incubator.
Intervention groups:

For the hammock positioning group: Using a rectangular cotton cloth tied at the top and ropes that flowed through the circular apertures of the incubator, researchers created a hammock. The preterm infant was placed in the hammock in the supine fetal position after an hour of feeding, with the head supported in a neutral midline position by rolled towels without neck hyperflexion or hyperextension. Also, the preterm neonate's knees and arms were extended while their spine was stabilized. Scores for pain were taken 10, 3, and 10 minutes before and after painful operations. On three consecutive days, hammock positioning was done during the morning shift for an hour between 10:00 and 11:00.
The preterm infants were then given HP before being routinely cared for in an incubator. After 15 minutes from the intervention, instruments II and III were used to capture the physiological parameters of the neonates in the two groups. From February 2023 through the end of May 2023, data were gathered.

Administrative design:

Sohag University provided the necessary official authorization for the study's execution. After describing the study's goals to the NICU director, permission was gained to proceed.

Statistical Analysis

Data were categorized and sorted, and the outcomes were displayed in tables. On a suitable personal computer, the data were analyzed using the Statistical Package for the Social Sciences (SPSS Inc; version 21; IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was employed to determine the normality of the data. The qualitative data were described in terms of

numbers and percentages. Means and standard deviations were used to present continuous variables. Two means were compared using the t-test. When the chance of error was less than 5% (p 0.05), the results were deemed significant, and when it was less than 0.1% (p 0.001), they were deemed very significant.

Results

Table 1 illustrates that 57.5 % of the preterm neonates were females in the study group compared to 62.5% in the control group. The mean gestational age of preterm neonates in the hammock positioning and control groups are 34.7 ± 2.30, and 34.61 ± 2.6, respectively. The mean birth weight of preterm neonates in the hammock positioning and control groups presented as 2.243 ± 149.7, and 2.278 ± 139.4, respectively. The mean Apgar score at 1st minute is 8.01 ± 0.77, and 8.39 ± 0.84, for the study, and control groups respectively. Moreover, it presented as 9.08 ± 0.33 and 9.00 ± 0.72 of the study, and control groups respectively at the 5th minute.

Table 2 reveals the mean physiological parameters of preterm neonates with an increase in the mean temperature among preterm neonates observed after the application of HP (36.73±0.22 oC) compared to baseline temperature, which was 36.49±0.33 oC in each group. On the other hand, the mean temperature decreased among the control group from 36.87±0.15 oC to 36.63±0.11 oC. Concerning HR, it decreased to 132.22±4.47b/m after the application of HP in the hammock positioning group compared to preterm neonates in the control group (146.44±6.17). Regarding SpO2, preterm neonates of the HP group demonstrated more stabilized oxygen saturation after 1 hour of HP (97.05±1.44) compared to 94.56±0.86among control groups. The RR also decreased among preterm neonates after one hour of HP 48.09±6.45 c/m compared to 51.37±4.66 c/m among those in control groups. There were statistically significant differences between the two groups regarding all physiological parameters ($p<0.001$ for each).

The mean premature neonates' pain profile was discovered in Table 3. The study premature had a mean of 2.47 ± 0.45 versus 6.77 ± 2.19, based on changes in HR, compared to the control preterm. In terms of variations in SpO2, the study, and control premature had means that were 1.63 ± 0.33 and 3.60 ± 1.26, respectively. The means for the Brow Bulge, the research, and the control premature were 2.82 ± 0.44 and 5.04 ± 1.22, respectively. A mean of 2.22 ± 0.37 compared to 5.09 ± 1.39 for the Eye squeeze, research, and control early is concerning. It is alarming that the Nasolabial Furrow, the research, and the control premature had means that were 2.77 ± 0.56 and 6.44 ± 0.67, respectively. At a p-value of <0.05, there is a statistically significant difference between the study and control groups in all cases.

Table 4 and Figure 1. Revealed that 75% and 25% of the hammock positioning group had mild and moderate pain, while 50% and 25% of the control group had moderate and mild pain after hammock positioning. Also, there was a statistically significant difference between the hammock positioning and control group at a p-value <0.05 for all.

Table 1: The studied premature neonate distribution regarding their characteristics (n=80).

Items	Hammock positioning group n=40		Control group N=40		Test P value
	N	%	N	%	
Gender:					Chi-square
Male	17	42.5	15	37.5	1.012
Female	23	57.5	25	62.5	0.079
Gestational age: (weeks) Mean SD	34.7 ± 2.30		34.61 ± 2.6		T-test 0.804 0.093
Birth weight: Mean SD	2.243 ± 149.7		2.278 ± 139.4		1.232 0.074
Apgar score:					Chi-square
1st minute	8.01 ± 0.77		8.39 ± 0.84		2.657
5th minute	9.08 ± 0.33		9.00 ± 0.72		0.048* 0.645 0.092

*Significant at p <0.05. **Highly significant at p <0.01. Not significant at p>0.05

Table 2: Mean Scores of Physiological Parameters among Preterm Neonates

Physiological Parameters	Before Mean±SD		Significance	After Mean±SD		Significance
	HP Group (n=40)	Control Group (n=40)		HP Group (n=40)	Control Group (n=40)	
- Temperature	36.49±0.33	36.87±0.15	$\chi2$ =5.77 p= 0.07	36.73±0.22	36.63±0.11	$\chi2$ =56.22 p<0.001
- Heart rate (b/m)	142.77±6.33	143.89±8.79	$\chi2$ =3.67 p= 0.113	132.22±4.47	146.44±6.17	$\chi2$ =87.04 p<0.001
- Oxygen saturation (SpO_2)	95.43±1.33	95.39±1.07	$\chi2$ =0.426 p= 0.819	97.05±1.44	94.56±0.86	$\chi2$ =49.87 p<0.001
- Respiratory rate (c/m)	53.44±7.22	52.43±5.52	$\chi2$ =0.435 p= 0.713	48.09±6.45	51.37±4.66	$\chi2$ =20.67 p<0.001

*Significant at aP< 0.001

Table 3: Comparison between the mean score of the pain profile scale in the premature neonates of the control and hammock positioning groups (n=80)

Items	Hammock positioning group	Control group	T-test	P value
	Mean SD	Mean SD		
Change in HR after hammock positioning	2.47 ± 0.45	6.77 ± 2.19	6.127	0.019*
Decrease O2 Saturation after hammock positioning	1.63 ± 0.33	3.60 ± 1.26	4.678	0.027*
Brow Bulge (sec) after hammock positioning	2.82 ± 0.44	5.04 ± 1.22	4.234	0.022*
Eye squeeze (sec) after hammock positioning	2.22 ± 0.37	5.09 ± 1.39	5.345	0.016*
Nasolabial Furrow(sec) after hammock positioning	2.77 ± 0.56	6.44 ± 0.67	4.325	0.018*

Table 4: Premature neonates distribution among control and hammock positioning groups regarding their total pain scale (n=80).

Items	Hammock positioning group N=40		Control group N=40		Chi-square	P value
	N	%	N	%		
Post hammock positioning						
Mild	30	75.0	10	25.0		
Moderate	10	25.0	20	50.0	7.234	<0.05*
Severe	0	0	10	25.0		

*Significant at p <0.05. **Highly significant at p <0.01. Not significant at p>0.05

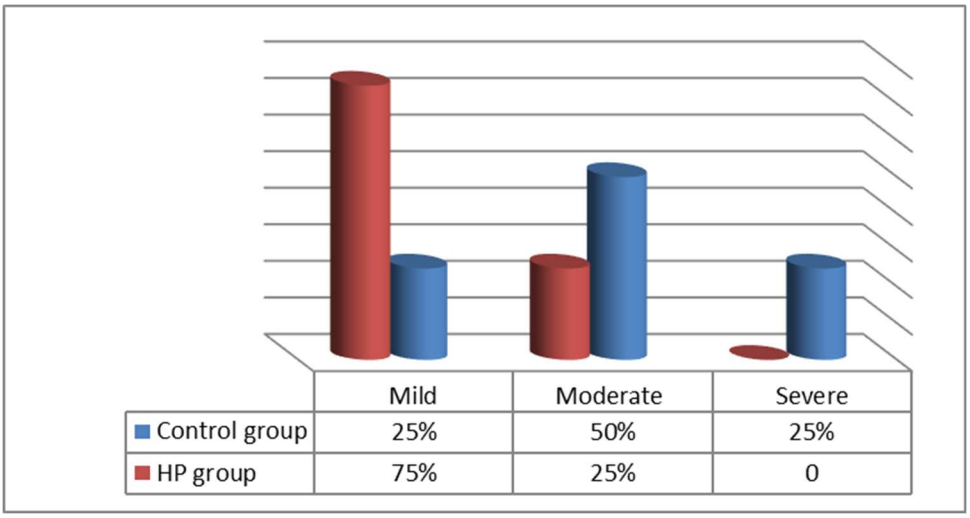

Figure 1. Premature neonates distribution in the control and hammock positioning groups concerning total pain scale post after hammock positioning (n=80).

Discussion:

The NICU's premature infants are repeatedly exposed to intrusive procedures and placed in an unfamiliar environment Gomes et al., (2012). The application of developmentally supportive care then provides a framework within which newborn environments and care practices are modified and organized to maximize development and lessen the negative effects of preterm birth. Jesus et al., (2018) include a variety of nursing strategies, including posture and sensory stimulation, that have been demonstrated to be helpful and promising for easing pain and promoting neurobehavioral growth in these critically ill neonates (Cardoso and others, 2015).

Preterm newborns respond to stimuli in a non-specific and disorganized manner because the nervous system lacks sufficient myelination and the endogenous pain control systems that regulate pain are immature. Premature newborns find it extremely difficult to control their behavior in the NICU setting. Cardoso et al., (2015). Because their autonomic nervous systems' capacity to control themselves is compromised due to prematurity, preterm neonates exhibit erratic behavior and increased stress reactions, which impede their ability to develop healthily. As of Liaw et al., (2018). The results of this study demonstrate that HP dramatically improved the condition of preterm neonates compared to the control group and produced better results.

The findings of the present study, which found that premature newborns placed in hammocks experienced improvements in their temperature, heart rate, breathing frequency, and SpO2, respectively, are supported by the data mentioned above. All physiological parameters between the two groups differed statistically significantly. It showed the benefits of using a hammock for positioning, according to the researchers.

It is recognized that body posture influences changes in physiologic variables (Ribas et al., 2019). So, minimizing the effects of the mechanical limits of the preterm infant's respiratory system requires ideal placement. In their 2016 study "Hammock position and nesting: Comparison of

physiological and behavioral effects in preterm newborns," Costa et al. discovered that both hammock placement and nest positioning had an impact on preterm infants' heart rates (each participant was his or her control, ie, each infant received the test intervention and, at a different time, the control intervention).
The hammock-positioning group showed a statistically significant yet safe drop in heart rate, supporting our findings. In contrast, Zanardo et al. (2020), who employed hammock configuration as an intervention in a study about "Oxygen saturation in premature neonates with bronchopulmonary dysplasia in a hammock," failed to identify statistically significant improvements in heart rate and SpO2. In contrast, in the current study, the participants in the hammock-positioning group experienced decreased heart rate and elevated SpO2. When hammock positioning was employed on a sample of 28 preterm infants, Jesus et al., (2018) who researched "Effects of hammock positioning in behavioral status, vital signs, and discomfort in preterms" noticed a decrease in heart rate and breathing frequency.

The current study's findings demonstrated that nearly all of the investigations by Jesus et al. (2018) and Costa et al. (2016) and others found that the hammock had a favorable impact on important metrics including HR and RR. According to some authors, Queiroz et al., (2017) studied "Repercussions in Newborns Using Hammocks and Prone Position" and found that this intervention simulates the intrauterine environment through physiological positioning and the small swing generated by this device with the assistance of the newborn's body. Ribas et al., (2019) conducted a study about the "Effectiveness of hammock positioning in reducing pain and improving sleep-wakefulness state in preterm infants." According to physiological theory, this might benefit the autonomous system by controlling breathing patterns and heart rate (Fernandes GA, Santos, 2014).

Because preterm neonates have increased energy and cardio-pulmonary needs, HP is a humanized strategy that lessens the stress that they endure. (Pereira et al., 2020 and Bensley et al., 2016, respectively) The results of the current investigation indicated that HP was effective in stabilizing the physiological indices of the preterm neonates in comparison to the control group in this regard. Despite this, preterm infants who received KMC displayed more consistent SpO2, RR, and HR. During HP, the c- afferent nerves on the mother's and the newborn's chest surfaces react to human contact and provide signals to the brain. Oxytocin is released gradually, stabilizing and soothing cardio-respiratory variables (Menger et al., 2021).

A decrease in infant cervical hyperflexion, which lowers the likelihood of apnea and a drop in SpO2, may be responsible for the current findings regarding the effect of HP on physiological indicators (Cho et al., 2016). Hammock location, according to Jesus et al. (2018), also promotes rib cage stability and provides the diaphragmatic muscle fiber more room to move, improving its effectiveness. Pereira et al. (2020) conducted a study on "The Hammock as a Therapeutic

Alternative at the Neonatal Intensive Care Unit" and found that HP induces more relaxation in neonates, resulting in lower HR and RR values that are more stable.

Costa et al., (2017) found that after HP, the heart and respiratory rates were also statistically considerably lower. On the other hand, Gomes et al. found no discernible differences in HR or SpO2 between the HP and other research groups (2021). According to Chiu et al., there were no variations in the SpO2 levels of newborns who were lying on a hammock or cot (2014).

Because HP has an advantage in terms of the stability of cardio-pulmonary parameters, it is thought to provide both short- and long-term benefits for preterm neonates. It consequently enhances stomach function, respiratory mechanics, and muscular tone while easing tension and promoting relaxation. Long-term brain development is additionally impacted by it. In their study, "Effectiveness of Hammock Positioning in Reducing Pain and Improving Sleep-Wakefulness State in Preterm Infants," Ribas et al., (2019) discovered that the hammock configuration was a helpful therapeutic choice for reducing pain and boosting sleep-wakefulness. In addition, OZdel & Sar (2020) found that giving preterm newborns environments that increase their comfort and enhance their physiological parameters causes a decrease in the energy they consume.
According to the current study, premature babies' suffering could be reduced by hammock placement. significantly lessen the intensity of the pain in comparison to the control group. The present study's findings supported the benefit of hammock configuration in lowering preterm infants' suffering. These findings are corroborated by a study by Gomes et al., (2020), which showed that endotracheal suctioning pain was significantly reduced. Moreover, the Premature Neonates Pain Profile score for the therapy group was significantly lower than for the control group, according to Lopez et al., (2015) research. Moreover, Francisco et al. (2021) who investigated "Positioning effects for procedural pain relief in NICU" came to the same conclusion and suggested that positioning be utilized as a non-pharmacological technique for procedural pain alleviation in infants. Cirik & Efe, (2020) indicated the swaddling+expressed breast milk method is a clinically better pain relief nonpharmacological option.

Because their central nervous systems have not fully developed, premature babies have immature inhibitory circuits that are triggered by pain. According to a recent study, PTNBs experience pain during invasive NICU operations. This discomfort is primarily brought on by aspiration through an airway and/or an orotracheal tube (Cruz et al., 2016). Also, the frequent procedures and unpleasant stimuli inside the facility more and more support the requirement for little to no handling of these patients (Cabral &Velloso, 2014). The use of low-risk, non-pharmacological techniques like hammock positioning that help PTNB patients feels less pain should be encouraged. This outcome can be explained by the study group's composition, which included hammock positioning with more neural pathway immaturity for pain and a lower gestational age and birth weight.

According to the current study's findings, the hammock placement group as a whole experienced mild to moderate pain following hammock positioning, with 35% and 14% reporting such pain. Also, the research and control groups differed statistically significantly from one another. Positioning a premature newborn in a hammock is advised from the researchers' point of view as one of the standard cares. To summarise, hammock configuration may be secure and reliable analgesia in premature newborns subjected to orogastric tube insertion.

Conclusion:

Based on our current study, it was concluded that hammock positioning had significantly decreased the severity of pain compared to the control group. In addition, hammock positioning had a positive effect in stabilizing the premature neonates' physiological parameters among premature neonates

Recommendation:

- Based on the prior research, we can suggest that all premature babies admitted to NICUs should get routine care that includes hammock positioning.
- In neonatal critical care units, there should be a brochure with illustrations that explains how to position a hammock step-by-step.
- Continuous training programs about Hammock positioning should implement regularly.

References:

Albuquerque, T.M., & Albuquerque, R.C. (2017). Positioning strategies and containment newborn preterm used in neonatal intensive care units. Rev Interinst Bras Ter Ocup (Rio de Janeiro); 1:40-51.

Bensley, J., De Matteo, R., Harding, R., & Black, M. (2016). The effects of preterm birth and its antecedents on the cardiovascular system. Acta Obstetricia et Gynecologica Scandinavica; 95(6): 652-63.

Bezerra, I., Torres, V., Lopes, J., Baroni, M., & Pereira, S. (2014). Assessment of the influence of the hammock on neuromotor development in nursing full-term infants. Rev Bras Crescimento Desenvolv Hum; 24(1):106---111.

Bortoli, A., & Taglietti, M. (2015). Efetividade do método hammock nas características pulmonares e maturidade neuromuscular em recém-nascidos internados em unidades de terapias intensivas neonatais: Revisão sistemática da literatura. FIEP Bull; 85.

Bucsea, O., & Riddell, R. P. (2019). Non- pharmacological pain management in the neonatal intensive care unit: managing neonatal pain without drugs. In Seminars in Fetal and Neonatal Medicine (Vol. 24, No. 4,

Bueno, M., Stevens, B., Rao, M., Riahi, S., Campbell-Yeo, M., Carrier, L., & Benoit, B. (2021). Implementation and Evaluation of the Premature neonates' Pain Profile-revised (PIPP- R) e-Learning Module for Assessing

Cabral. L., & Velloso, M. (2014). Comparing the effects of minimal handling protocols on the physiological parameters of preterm infants receiving exogenous surfactant therapy. Braz J Phys Ther; 18:152-64. http://dx.doi.org/10.1590/ S1413-35552012005000154

Cardoso, S., Kozlowski, L., de Lacerda, A., Marques, J., & Ribas, A. (2015). Newborn physiological responses to noise in the neonatal unit. Brazilian Journal of Otorhinolaryngology; 81(6): 583-8.

Chiu, K., Tonkin, S., Gunn, A., & McIntosh, C. (2014). Are baby hammocks safe for sleeping babies? A randomized controlled trial. Acta Paediatrica; 103(7): 783-7.

Cho, E., Kim, S., Kwon, M., Cho, H., Kim, E., & Jun, E. (2016). The effects of kangaroo care in the neonatal intensive care unit on the physiological functions of preterm infants, maternal-infant attachment, and maternal stress. Journal of Pediatric Nursing; 31(4): 430-8.

Cirik, V. A., & Efe, E. (2020). The effect of expressed breast milk, swaddling and facilitated tucking methods in reducing the pain caused by orogastric tube insertion in premature neonates: A randomized controlled trial. International Journal of Nursing Studies, 104, 103532.

Costa, K., Beleza, L., Souza, L., & Ribeiro, L. (2016). Hammock position and nesting: comparison of physiological and behavioral effects in preterm infants. Rev Gaúcha Enferm; 37:e62554. https://doi.org/10.1590/1983-1447.2016.esp.62554

Cruz, C., Gomes, J., Kirchner, R., & Stumm, E. (2016). Evaluation of pain of neonates during invasive procedures in intensive care. Rev Dor; 17:197-200. http://dx.doi.org/10.5935/1806-0013.20160070

Davari, S., Borimnejad, L., Khosravi, S., & Haghani, H. (2019). The effect of the facilitated tucking position on pain intensity during heel stick blood sampling in premature neonates s a surprising result. The Journal of Maternal-Fetal & Neonatal Medicine, 32(20), 3427-

Fernandes, G., & Santos, T. (2014). Evaluation of signs of stress in newborn preterm placed in rocking network neonatal intensive care unit: an experimental clinical study with the blinded evaluator. São Paulo.

Francisco, G., Montemezzo, D., dos Santos Ribeiro, S. N., Frata, B., Menegol, N. A., Okubo, R., ... & Sanada, L. S. (2021). Positioning effects for procedural pain relief in NICU: a systematic review. Pain Management Nursing, 22(2), 121-132.

Gomes, A., Teixeira, E., Feliciano, J., Barreto, J., Aparecida, C., & Leal, É. (2021). Effects of the hammock method on preterm newborns: systematic review and meta-analysis. Child`s Health; 16(2): 164-72.

Gomes Neto, M., da Silva Lopes, I. A., Araujo, A. C. C. L. M., Oliveira, L. S., & Saquetto, M. B. (2020). The effect of facilitated tucking position during the painful procedure in pain management of premature neonates in neonatal intensive care unit: a systematic review and meta-analysis. European Journal of Pediatrics, 179(5), 699–709. https://doi.org/10.1007/s00431-020- 03640-5.

Hamad, N. I., Khamis, G. M., & Rashwan, Z. I. (2022). Effect of Kangaroo Mother Care versus Hammock Positioning on Physiological Indices and Behavioral Organization among Preterm Neonates: A Humanized Nursing Approach. Tanta Scientific Nursing Journal, 25(22), 37-48.

Huang, W., Ural, S., & Zhu, Y. (2022). Preterm labor tests: Current status and future directions. Critical Reviews in Clinical Laboratory Sciences, 59 (4), 278–296. https://doi.org/10.1080/10408363. 2022.2027864

Jesus, V., Oliveira, P., & Azevedo, V. (2018). Effects of hammock positioning in behavioral status, vital signs, and pain in preterms: a case series study. Braz J Phys Ther; 22:304-9. https://doi.org/10.1016/j.bjpt.2018.03.002

Kaya, A. (2017). The significance and effectiveness of kangaroo care for premature infants. New Trends and Issues Proceedings on Advances in Pure and Applied Sciences; (8):92-7

Liaw, J., Yang, L., Hua, Y., Chang, P., Teng, C., & Li C. (2018). Preterm infants' biobehavioral responses to caregiving and positioning over 24 hours in a neonatal unit in Taiwan. Research in Nursing & Health; 35(6): 634-46.

Lopez, O., Subramanian, P., Rahmat, N., Theam, L. C., Chinna, K., & Rosli, Mahmoodi N, Arbabisarjou A, Rezaeipoor M, & Pishkar Mofrad, Z. (2015). Nurses' awareness of preterm neonates' sleep in the NICU. Global Journal of Health Science; 8(6): 226.

Menger, J., Mafaldo, L., Schiwe, D., Schaan, C., & Heinzmann-Filho, J. (2021). Effects of hammock positioning on clinical parameters in preterm infants admitted to a neonatal intensive care unit: A systematic review. Revista Paulista de Pediatria; 39.

Obeidat, H. M., & Aloweidi, A. S. (2021). Pain in Premature Neonates: Different Perspectives. The Journal of Perinatal Education, 30(4), 185-195.

Özdel, D., & Sarı, H. Y. (2020). Effects of the prone position and kangaroo care on gastric residual volume, vital signs, and comfort in premature neonates. Japan Journal of Nursing Science, 17(1), e12287.p. 101017). WB Saunders.

Park, Y. A., & Im, Y. J. (2020). The effects of continuous olfactory stimulation using breast milk (COSB) on behavioral state and physiological responses in Korean premature neonates s. Journal of pediatric nursing, 53, e114-e120.

Pereira, S., Filho, G., Holanda, N., Vieira, D., & Moran, C. (2020). The hammock is a therapeutic alternative at the neonatal intensive care unit. Manual Therapy, Posturology & Rehabilitation Journal: 1-4.

Queiroz, C., Santos-de-Araújo, A., Ferreira, L., Silva, J., Bassi, D., & Souza, CT. (2017). Repercussions in newborns using hammocks and prone position. Rev Investig Bioméd; 9:159-67. https://doi.org/10.24863/rib.v9i2.127

Ribas, C. G., Andreazza, M. G., Neves, V. C., & Valderramas, S. (2019). Effectiveness of hammock positioning in reducing pain and improving sleep-wakefulness state in premature neonates. Respiratory care, 64(4), 384-389. https://doi.org/10.4187/respcare.06265

Sadeghi, A., Rassouli, M., & Farhadi, R. (2019). Effects of Sleep and Awake States on Pain Responses in Premature neonates s. Journal of Pediatrics Review, 7(5), 3-3.

Sharma, N. (2021). A Study to Assess the Effectiveness of Facilitated Tucking Position on Pain Perception among Neonates During Vaccination in Selected Hospital of Panipat, Haryana. International Journal of Nursing Education, 13(3).

Stevens, B., Johnston, C., Petersen, P., & Taddio, A. (1996). Premature neonates pain profile: development and initial validation. The Clinical Journal of Pain, 12(1), 13-22. doi: 10.1097/00002508-199603000-00004.

Wang, F., Zhang, Q., Ni, Z. H., & Lv, H. T. (2022). Effects of kangaroo care on pain relief in premature neonates s during painful procedures: A meta-analysis. Journal for Specialists in Pediatric Nursing, e12390. https://doi.org/10.1111/jspn.123 90

Zanardo, V., Trevisanuto, D., Dani, C., Bottos, M., Guglielmi, A., & Cantarutti, F. (2020). Oxygen saturation in premature neonates with bronchopulmonary dysplasia in a hammock. Biol Neonate; 67(1):54-58.