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Original Article

Effect of Crochet Octopus on Physiological Parameters and Comfort Level among Preterm Infants

Gehan Mohammed Amin[1], Samar Sobhi Abd Elkhair[2]

[1]Lecturer of Pediatric Nursing, Faculty of Nursing, Cairo University
[2]Lecturer of Pediatric Nursing, Faculty of Nursing, Cairo University

ABSTRACT

Background and aim: preterm infants are exposed to various stressful practices in NICU such as recurrent aggressive and painful procedures, excessive sensory stimulation such as extreme light and sound, improper sleep patterns, and improper handling. Using crochet octopus might enhance preterm physiological parameters and comfort level. **The aim** of the study was to evaluate the effect of crochet octopus on physiological parameters and comfort level among preterm infants. **Design**: Quasi quasi-experimental pretest-posttest design was utilized. **Sample**: A Purposive sample of 30 preterm infants participated in the study. Data were collected through a socio-demographic data sheet, physiological parameters assessment, and comfort scale. **Setting**: the study was conducted in the NICU at Elmonira University Pediatric Hospital. **Results**: There were statistically significant differences in the mean score of respiratory rate between before using octopus, 6 hours after using, and before and one day after (P = 0.024 & 0.016, respectively). There were statistically significant differences in the mean score of heart rate between before using the crochet octopus and 6 hours after use and also before and one day after (P = 0.044*& 0.027, respectively). There were statistically significant differences in the total mean score of the comfort scale between before using the crochet octopus, 6 hours after use, and before and one day after (P = 0.041 & 0.023, respectively). **Conclusion**: The use of crochet octopus enhanced the physiological parameters of preterm infants as well; it improved their comfort score level. **Recommendations**: Nurses in the NICU could use the crochet octopus as an adjuvant strategy and integrate it into clinical practice while caring for preterm infants.

***Keywords*:** crochet octopus, physiological parameters, Comfort Level, preterm Infants.

Introduction

Preterm birth is when the baby is born early, before the end of the 38th week of gestation. Prematurity is one of the leading causes of infant mortality and morbidity of international concern. Globally, prematurity is the leading cause of death in children under 5 years of age. It is estimated that 15 million babies are born prematurely each year. Many survivors face disabilities including learning disabilities, and hearing and vision problems (World Health Organization, 2022).

Preterm infants are typically admitted to the Neonatal Intensive Care Unit (NICU), where their future development is hampered by the detrimental sensory impacts on their developing brains. The consequences that are incompatible with the nervous system's expectations such as parental separation, frequent painful and aggressive treatments, and excessive sensory stimulation are common among newborns admitted to NICU. These events cause significant alterations in the neurological system (El-Metwally & Medina, 2020).

Moreover, a newborn's development can be disrupted by a variety of factors, including improper sleep patterns in the NICU, inattention to the newborn's behaviors, positioning changes from full intrauterine flexion to supine and extension, rapid and inappropriate handling, invasive methods, excessive light and sound in the environment, and a failure to improve sucking skills(Soleimani,Azari, Ghiasvand,& Fatollahierad, 2020).

Developmental care is an approach to individualize the care of infants to maximize neurological development and reduce long-term cognitive and behavioral problems by changing the baby's surroundings to provide a normal daily cycle and decrease noise and stress (Riad et al., 2023). Developmental care includes a variety of medical and nursing techniques. The main goals of developmental care are to protect the developing brains of preterm newborns, promote their growth, and attend to their behavioral needs by offering a specially created environment and consistent care. Better daily weight gain at discharge is linked to developmental care, as well as fewer instances of late-onset sepsis, feeding intolerance, and the need for parenteral feeding, ventilator support, and antibiotic medication, increase the preterm comfort level and enhance their physiological parameters (Pavlyshyn, Sarapuk, Tscherning & Slyva, 2023).

A key component of excellent nursing care is developmental care. Providing a structured care setting that supports and fosters the growth of premature infants is the aim of developmental care. In addition to minimizing long-term cognitive and behavioral issues that may arise from the stressful experience in neonatal intensive care, it optimizes brain development. It involves reducing exposure to light and noise, adopting clustering of care and non-nutritive suckling and calming techniques, and making appropriate skin-to-skin contact or kangaroo care (Khalil, Abd-Elsalam, Rezk & Abd El Motaleb, 2021).

Premature babies are at risk for developing severe health issues such as eating issues, breathing issues, and developmental delays. Soft toys called octopi are used as a non-pharmacological kind of therapy to soothe and calm premature infants. Octopi are also used as a form of developmental care tool for preterm infants (Siqueira, Barbosa, da Silva, & Porto, 2019). Using the octopi for preterm infants in the NICU might lead to better breathing, more regular heartbeats, and higher level of oxygen. Furthermore, when placing the octopus beside preterm infant skin, the infants will be able to have their mother close to them. While this isn’t the

same as kangaroo care, babies respond well to it (Zivaljevic, Jovandaric, Babic, & Raus, 2024).

Benzaken (2018) mentioned that the infants that cradled their octopus had overall health improvements and were less bothered by the various monitors and intravenous connections. The presence of the tiny crochet toy acted as a great calming effect on the infant. As well as the arms of the crocheted octopuses remind the little infant of the umbilical cord in their mommies' bellies and make them feel safer and evoke the comfort of the womb.

The main caregivers in NICUs are neonatal nurses, who play a crucial role in shaping the environment in which developing neonates are placed. In order to promote the optimal normal physical, psychological, and emotional development of newborns, nurses can take the following actions while providing nursing care: reducing surroundings light and noise to reduce stimuli; clustering procedures to minimize sleep disruptions; altering regimens to improve feeding tolerance; and providing opportunities for nurturing bonding experiences between the newborns and parents (Kumar, Akangire, Sullivan, Fairchild &Sampath, 2020).

Significance of the study

The earlier a baby is born, the higher the risk of death or serious disability. In preterm birth and low birth weight accounted for about 16% of infant deaths (Center for Disease Control & Prevention, 2022). In Egypt, Neonatal deaths accounted for 54% (13% per 1000 live birth) and preterm birth about 7% per 100 live births (WHO, 2023). Reports indicate that 123.13% of preterm births occur between 32 and less than 37 weeks of gestation. According to this information, the annual admission rate to the NICU is greater (Hassan, 2022).

Moreover, the main factor contributing to long-term developmental impairments is prematurity. Prematurity can lead to a variety of long-term, potentially permanent problems with an individual's respiratory, neurological, and metabolic systems in addition to their physical health. Prematurity-related complications account for a portion of the burden of chronic illnesses in adulthood. As a result, the emphasis on care for preterm newborns admitted to NICU has switched from raising survival rates to lowering complications and enhancing quality of life (Soleimani, Azari, Ghiasvand, & Fatollahierad, 2020).

Çövener, Eren, Sabaz, and Bulut (2023) and Sabaz (2022) found that crochet octopus affected physiological measurements of the neonates positively and reduced procedural pain as well. Siqueira, et al (2019) concluded that crochet octopus improved respiratory rate, heart rate, and oxygenation for preterm infants.

In Egypt, there are limited studies conducted and focused on using crochet octopus for premature infants. Therefore, the current study is undertaken to evaluate the effect of crochet octopus on physiological parameters among preterm infants. Hopefully, the outcomes will set a standard of care that can be followed to improve the physiological parameters of premature infants.

Furthermore, it will offer direction and suggestions that ought to be included in pediatric nursing education, as well as data grounded in evidence that can advance nursing practice and research in the pediatric nursing domain.

Methods

Operational Definition:-

Crochet octopus is a form of non-pharmacological therapy and is also used as a tool of developmental care that helps to comfort and calm preterm infants. It is a toy made of firm crochet, the stitches tightly closed with rows of crochet, eyes, and mouths sewn, without using paint, glue, or plastic eyes. The Octopus body consists of 8 tentacles 20 to 22 centimeters long with the head measuring 8 to 10 centimeters.

Physiological parameters are respiratory rate, heart rate, temperature, and oxygen saturation.

Comfort level is the degree of distress measured by the comfort scale

Aim of the study

The aim of the current study was to evaluate the effect of crochet octopus on physiological parameters and comfort level among preterm infants.

Research Hypotheses

To achieve the aim of the study, the next research hypotheses were designed:

1. Using crochet octopus for premature infants is expected to enhance their vital signs (respiratory rate and heart rate).
2. Using crochet octopus for premature infants is probable to improve their oxygen saturation level.
3. Using crochet octopus for premature infants is likely to increase their comfort level.

Subject and methods

Research Design

The quasi-experimental pretest-posttest design will be used to accomplish the aim of the present study. In that design one group of participants is tested before the intervention is implemented and also after implementation. (Isnawan, 2022).

Setting

The study was carried out in the neonatal intensive care unit (NICU) at Elmonira University Pediatric Hospital. It receives infants from all over Egypt and provides complete care for neonates.

Participants

A purposive sample of 30 preterm infants was participating in the study. The sample size was calculated depending on the following equation (Martin, 2024).

$$n = \frac{T^2 \times p\,(1-p)}{m^2}$$

Description:

n = required sample size.

t = confidence level at 95% (standard value of 1.96).

p = estimated prevalence of preterm infants in 2022 at CUPH (0.72).

m = margin of error at 5% (standard value of 0.05).

$$n = \frac{(1.96)^2 \times 0.72(1-0.72)}{(0.05)^2} = 30$$

Inclusion criteria:

- Preterm infants with both genders.
- Preterm infants their gestational age 32 to less than 37 weeks

Exclusion criteria:

-Preterm infants who are isolated or intubated.

- Preterm infants who receive sedatives

Data collection tools:

The data was collected by the following tools:

Tool (1) Characteristics of preterm infants: it was developed by the researchers and includes 5 items; infant's gender, weeks of gestation, mode of delivery, diagnosis, and birth weight.

Tool (2) Physiological Parameters Assessment Tool for Preterm Infants; the tool was developed by the researchers after a wide-ranging review of literature which includes 4 items for assessing respiratory rate, heart rate, temperature, and oxygen saturation.

Scoring system:

Physiological parameters were evaluated by means and standard deviation.

Tool (3) the comfort scale of preterm infants:

The scale is adapted from **Sarkaria & Gruszfeld (2022)** that measures the level of comfort for preterm infants which includes 7 items and only 5 items were selected because they will achieve the aim of the study. The tool includes the following items: alertness, calmness/agitation, crying, physical movement, and facial tension. Each item is comprised of 5 points.

Comfort scale score interpretation:

The scale is comprised of 5 items; each item has 5 points scored from 1-5. The total score of the scale is 25. Scores 5-11 indicate complete comfort, 12-17 indicate adequate comfort, and 18-25 indicate inadequate comfort of preterm infants.

Validity and Reliability

Three pediatric neonatal nursing specialists examined the tools to assess their content validity. The specialists' opinions guided the modifications made to the instruments. Content coverage, clarity, relevance, applicability, phrasing, structure, and overall appearance of the tools were all evaluated. Cronbach's alpha was used to assess the tools' reliability and consistency.

Procedure:

After taking the approval of the research ethics committee of the Faculty of Nursing, Cairo University. Official permissions were obtained from the director of Elmonira University Pediatric Hospital, and from the head of NICU. The researchers introduced themselves to the nurses of the unit and selected preterm infants who fulfilled the inclusion criteria. In the first visit written formal consent was obtained from the mothers after an explanation of the aim, the nature of the study, and their rights. After the acceptance of the mothers to participate in the study, the researchers

visited the NICU 2 days weekly on Monday and Wednesday. The researchers filled the three tools before using crochet octopus. All data about the preterm medical history was obtained from the newborn medical records on an individual basis. After that, the crochet octopus is placed inside the incubator near and in close contact with the infant for 24 hours. 6 hours (8 am-2 pm) during the routine care provided for premature neonates. Physiological parameters and comfort scale were filled immediately after 6 hours on the same day, and also on the 2nd day after 24 hours.

Statistical analysis

The Statistical Package for Social Science (SPSS) software version 21 was used to code, categorize, tabulate, and analyze the data that had been gathered. The standard deviation and mean were used to express descriptive data. Frequency and percentage were used to express qualitative data. The paired sample t-test was used to compare the means. The Pearson correlation coefficient was used to perform correlations between variables. P < 0.05 was chosen as the level of significance and the cutoff value for statistical significance.

Ethical Considerations

A principal approval was gained from the research ethics committee in the Faculty of Nursing, Cairo University. Written informed consent was obtained from the mothers by the researchers after a complete description of the goal and nature of the study. Furthermore, confidentiality was assured to all mothers.

Results

Table (1) illustrates that more than half (53.3%) of preterm infants were males, the majority (90%) had a gestational age between 34 ≤ 37, and more than three quarters (76.6%) their weight was between 1500 ≤ 2500 gm with the mean weight of 2446.83 ± 442.365. Regarding the type of delivery, the majority of preterm infants (83.3%) were born by cesarean section. Likewise, more than two-thirds of preterm infants (73.3%) were diagnosed with neonatal jaundice.

Table (2) proves that there were statistically significant differences in the mean score of respiratory rate between before using octopus, 6 hours after using, and also before and one day after (P = 0.024 & 0.016, respectively). Moreover, there were statistically significant differences in the mean score of heart rate between before using the crochet octopus and 6 hours after use and also before and one day after use (P = 0.044*& 0.027, respectively). While there were no statistically significant differences in the mean score of axillary temperature and SpO2 between before using crochet octopus and 6 hours after and also before and one day after use (P > 0.05).

Table (3) shows that there were statistically significant differences in the mean score of calmness between before using the octopus, 6 hours after use, and also before and one day after (P = 0.032 & 0.010, respectively). There were statistically significant difference in the mean score of crying between before using crochet octopus and 6 hours after and also before and one day after use (P = 0.014 & 0.000, respectively).

Additionally, there were statistically significant differences in the mean score of facial tension between before using crochet octopus and 6 hours after use, and also before and one day after use (*P* = 0.000 & 0.000, respectively). Furthermore, there were statistically significant differences in the total mean score of the comfort scale between before using the crochet octopus and 6 hours after use, and before and one day after use (*P* = 0.041 & 0.023, respectively)

As revealed in Table (4), there were highly statistically significant negative correlations between preterm comfort level and physiological parameters in relation to respiratory rate and heart rate (P = 0.013 & 0.001, respectively).

As shown in Table (5), there were highly statistically significant correlations between type of delivery with preterm respiratory rate, heart rate, and temperature (P = 0.01, 0.04 & 0.02, respectively).

Table (6) illustrates that there were no statistically significant correlations between data of preterm infants concerning infants' age, weeks of gestation, mode of delivery, parental consanguinity, and gender, with their comfort level (P > 0.05).

Table (1): Percentage distribution of the preterm infants according to their characteristics (n=30).

Characteristics of preterm infants	**No.**	**%**
Gender		
Male	16	53.3
Female	14	46.7
Gestational age/weeks		
31 < 34	3	10
34 ≤ 37	27	90
Mean ± SD	36.5 ± 1.1	
Birth weight/gm		
1500 < 2500	23	76.6
2500 < 3500	7	23.4
Mean ± SD	2446.83 ± 442.365	
Mode of delivery		
Normal vaginal delivery	5	16.7
Cesarean section	25	83.3
Infant diagnosis		
Neonatal jaundice	22	73.3
RDS	5	16.7
Transient tachypnea of neonate	3	10

Table (2): Comparison of the total mean scores of preterm physiological parameters between before and 6 hours after and before and one day after (n=30).

Physiological parameters	Before		6 hours after		One day after		Difference between before and 6 hours after		Difference between before and one day after	
	Mean	SD	Mean	SD	Mean	SD	t	p	t	p
Respiratory rate	43.97	5.10	41.87	2.98	40.63	3.70	4.185	0.024*	5.296	0.016*
Heart rate	136.77	8.42	134.70	8.86	131.70	8.84	3.928	0.044*	3.275	0.027*
Axillary temperature	36.92	0.55	36.93	0.29	37.07	0.20	0.088	0.930	1.404	0.166
SpO2	96.87	2.81	97.14	1.98	97.57	2.32	0.430	0.669	1.052	0.297

*significant at p-value<0.05

Table (3): Comparison of the total mean score of the comfort scale between before and 6 hours after and before and one day after (n=30).

Comfort scale	Before		6 Hours after		One day after		Difference between before and 6 hours after		Difference between before and one day after	
	Mean	SD	Mean	SD	Mean	SD	t	p	t	p
Alertness	2.30	0.92	2.29	0.76	2.14	0.59	0.046	0.964	0.802	0.426
Calmness	1.90	0.99	2.07	0.60	1.96	0.44	5.104	0.032*	6.303	0.010*
Cry	2.23	1.01	2.39	0.83	2.15	0.72	4.670	0.014*	7.082	0.000*
Physical movement	2.27	0.58	2.25	0.52	2.22	0.42	0.141	0.889	0.382	0.704
Facial tension	2.37	0.38	1.96	0.19	2.00	0.18	5.286	0.000*	4.820	0.000*
Total	8.80	3.43	10.90	2.26	12.48	1.74	4.567	0.041*	5.214	0.023*

*significant at p-value<0.05

Table (4): Correlation between Physiological parameters of preterm infants and comfort scale

Physiological parameters	Comfort level	
	r	p
Respiratory rate	-0.35	0.013*
Heart rate	-0.45	0.001**
Axillary temperature	-0.11	0.316
SpO2	-0.12	0.257

*significant at p-value<0.05

Table (5): Correlation between characteristics of preterm infants and their physiological parameters

Data of preterm infants	Respiratory rate		Heart rate		Axillary temperature		SpO2	
	r	p	r	p	r	p	r	p
Age (days)	0.1	0.34	0.05	0.59	0.07	0.5	0.26	0.51
Weeks of gestations	0.18	0.08	0.04	0.70	0.07	0.5	0.01	0.89
Mode of delivery	0.25	0.01*	0.29	0.04*	0.24	0.02*	0.18	0.09
Parental consanguinity	0.17	0.09	0.23	0.92	0.15	0.14	0.03	0.78
Gender	0.06	0.94	0.05	0.95	0.59	0.55	1.1	0.29

*significant at p-value<0.05

Table (6): Correlations between characteristics of preterm infants and their comfort level

Data of preterm infants	Comfort level	
	r	p
Age(days)	0.1	0.36
Weeks of gestation	0.07	0.49
Mode of delivery	0.15	0.17
Parental consanguinity	0.007	0.94
Gender	1.5	0.12

*significant at p-value<0.05

Discussion

Premature infants in the NICU encounter a stressful extra-uterine environment due to numerous manipulations, invasive procedures, noise, excessive lighting, and postural disorganization. Such situations need to be addressed and should be a priority aims for premature infants' development. Octopus is a cuddly toy that can be used as a form of therapy to help comfort and calm premature infants. The current study evaluates the effect of crochet octopus on physiological parameters and comfort level among preterm infants. The present study findings discovered that the majority of preterm infants had gestational age between 34 ≤ 37 and more than half weighed 1500 < 2500 gm at birth. These results were supported by Elewa, Amin, and Ayed (2021) who found in their study that around two-thirds of premature infants belong to the gestational age between 34 ≤ 37 weeks, and also, more than half were birth weight between 1500 < 2500 gm. Also, these results are nearly similar to those of **Sumathy (2020)** who reported that most preterm infants weigh between 1.5 and 2.0 kg.

As revealed in the study findings; the majority of preterm infants were born by cesarean section and more than two-thirds were diagnosed as neonatal jaundice. These results were matched with a study done by **Mohamed and Elashry (2022)** who proved that less than three-quarters of neonates in two groups were delivered by lower segment cesarean section and a large percentage of them had neonatal jaundice. Another study conducted by **Huff et al., (2019)** supported the current results as they stated that, jaundice, difficulty breastfeeding, and infection are the three leading causes of hospital readmission in late-premature infants.

Moreover, The findings of the current study detected that there were statistically significant differences in the mean score of respiratory rate and heart rate of preterm infants between before using crochet octopus and 6 hours after and also before and one day after use. These results were consistent with **Gatewood (2017)** who mentioned that with the octopi, neonates in the NICU experienced better breathing and more regular heartbeats. These results were not congruent with **Ozcelik et al. (2022)** who found that there were no significant differences in terms of median heart rates and respiration of neonates before and after contact with octopus.

Moreover, the current study results proved that there were no statistically significant differences in the mean score of SpO2 between before using crochet octopus and 6 hours after and also before and one day after use. These results contradicted the study conducted by **Siqueira et al. (2019)** who observed that premature babies near the octopuses in their incubators had higher blood oxygenation levels. Also, the current findings were not matched with **Ozcelik et al. (2022)** who revealed that neonates in contact with octopus experienced less desaturation than the control group. From the researcher's point of view in order to improve the oxygen level, octopuses must be used for the preterm infants for longer periods.

As shown in the present study results there were statistically significant differences in the total mean score of comfort level between before using crochet octopus and 6 hours after use, and before and one day after use. Similarly, **Tekin (2024)** reported that using octopus increases the comfort level of premature infants. Moreover, **Benzaken (2018)** stated that the infants that cradled their octopus had overall health improvements and were less bothered by the various monitors and intravenous connections and the presence of the tiny crochet toy acted as a great calming effect on the infant. Additionally, Smith et al. (2021) support the study results as they stated that premature babies hold the tentacles of the octopus they were calmer, less likely to interfere with monitoring equipment, and appear more comfortable overall. Furthermore, a study conducted by **Ozcelik et al. (2022)** proved that the durations of crying of preterm infants of the group in contact with the octopus were lower than those of the control group. From the researchers' perspectives and based on previous reviewing literature when preterm infants grasp the tentacles of the octopus might lead to a simulation of the experience they had while holding the umbilical cord in the intrauterine environment. This experience helps them to achieve a better calming state and might result in a stabilizing heart rate and improved respiratory pattern.

The present study findings proved that there were highly statistically significant correlations between preterm comfort level and physiological parameters in relation to respiratory rate and heart rate. A similar study conducted by **Altay & Kucukoglu (2022)** supported the present study findings and they reported that facilitated tucking as a non-pharmacological method decreased

change in heart rate, respiratory rate, and oxygen saturation which was linked to an increasing time of quiet and active sleep, while decrease time of active alert and crying among premature neonates. Furthermore, a study carried out by **Akgul and Yanar (2024)** was in line with our results as they found that using therapeutic toy intervention positively affected the comfort level and duration of crying of neonates which resulted in a positive effect on their vital signs. From the researchers' points of view and based on reviewing previous related literature the neonates' vital signs of alert neonates who are distressed or cry are different from those of calm and sleepy neonates. Therefore, when the neonates feel comfortable and calm, their physiological parameters will be decreased to normal, but if they feel distressed and cry, their parameters will be changed.

Additionally, the current study results reported that there were highly statistically significant correlations between type of delivery with preterm respiratory rate, heart rate, and temperature. These findings were in line with **Tefera et al (2020)** who mentioned that infants born by the abdominal approach are associated with physiological changes due to greater morbidity while vaginal delivery is safer in newborns, so there was a link between the delivery modality and newborn physiological parameters.

Conclusion

The findings of the current study concluded that the use of crochet octopus enhanced the physiological parameters of preterm infants with regard to respiratory rate and heart rate as well; it improved the preterm comfort score level. Moreover, there was a highly statistically significant correlation between preterm comfort level and physiological parameters of preterm infants. Consequently, these outcomes supported the proposed study hypotheses.

Recommendations

On the basis of the study findings, the subsequent recommendations are proposed:

- Nurses in NICU can use the crochet octopus as an adjuvant strategy and integrate it into clinical practice while caring for preterm infants in order to enhance the preterm comfort level and physiological parameters.

- Develop a premature infant care education program for the nurses to improve their skills regarding the use of new different strategies that can be used while caring the preterm infants.

- Larger studies for long duration could be carried out to fully assess the efficacy of crochet octopus on improving preterm development.

- Evaluation and implementation of other useful care measures for preterm infants in NICU have become significant concerns to be considered in the conducted research.

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