Crossover Study: Effect of Facilitated Tucking Position on Preterm Infants Pain and suction duration during Endotracheal Suctioning

Doaa, A.Zayed[1]& Amal A. Fathalla[2]
1Lecturer of Pediatric Nursing, Faculty of Nursing, Menoufia University, Egypt, 2Assistant professor of pediatric nursing, Faculty of nursing, Menoufia university, Egypt

Abstract

Background: Preterm infants are frequently subjected to many painful procedures. One of the valuable strategy of non-pharmacological methods that helps the preterm infant to manage procedural pain is the facilitated tucking position. The aim of this study was to examine the effect of facilitated tucking position on preterm infants' pain and suction duration during endotracheal suctioning. The design of this study was randomized controlled crossover design. It was carried out at neonatal intensive care unit in El Gamea El Sharea Center and Shebin El-Koom Teaching Hospital at Shebin El-Koom City. Sample: A purposive random sample of 30 premature infants was selected from the settings mentioned previously. Instruments: Three data collection instruments were used; preterm infant's assessment sheet, preterm infant pain profile and Suction Duration assessment sheet. Results: preterm infants with intervention had shorter suction duration (14.60 ± 3.32 VS 18.93 ± 4.37), lower pain score (9.20 ± 3.03 VS 13.03 ±3.10), more physiological stability, mean maximum heart rate (9.96 VS 16.80) and mean minimum oxygen saturation (3.73 VS 5.93). It was concluded that, infants who were in facilitated tucking position during endotracheal suctioning experienced more physiological stability, lower pain score and shorter suction duration compared to preterm infants who was received routine endotracheal suctioning. So, it was recommended that facilitated tucking position could be included in standard daily care during painful procedures for preterm infants.

Key Words: Endotracheal Suctioning, Facilitated Tucking Position, Preterm Infants Pain, Suction duration

Introduction:

Preterm birth is an important perinatal health problem across the world. Around the world, preterm birth is one of the main cause of death and long-term loss of human abilities **(Çelebioğlu & Üğücü, 2019).** Preterm birth rates in the world average 15 million per year, or more than one in every ten newborns (World Health Organization, 2018). In addition, 83%-95% of the extremely low birth weight infants and 27% of the preterm infants require help for artificial ventilation**.(Taplak & Bayat, 2021).**

Preterm infants are born before the body's systems and functions can adapt to the environment outside the womb **(Gomes Neto et al., 2020)**.In addition, they are subjected to painful procedures that overstimulate all sensory systems comparing to stimulation in uterus **(Hatfield et al., 2019).** Moreover, preterm infant in the first 2 weeks of their lives is subjected to a daily average of 14 unpleasant procedures and most of the painful procedures were heel stick or suctioning **(Bonutti et al., 2017).**

Endotracheal suctioning is an invasive manual procedure that is used routinely for preterm infants who need mechanical ventilation for removal of tracheobronchial secretion **(Yiğit & Altun, 2018).** In addition, endotracheal suctioning in preterm infants is not a benign procedure, it is associated with pain and stress. Also, it is complicated by significant morbidity ranging from short-term hypoxia to structural damage and death in preterm infants **(Hatfield et al., 2019).** Furthermore, The endotracheal suctioning increase response to stress by the endocrine glands and the preterm infant not only experience and comprehend pain, but they also react to it more strongly compared to term infants due to imbalance in actions of neurotransmitters **(Ranjbar et al., 2020).** Autonomic and behavioral systems in preterm newborns experience stressful reactions.The

physiological reactions for the autonomic system manifest as variations in heart rate, respiratory rate, blood pressure, oxygen saturation, and skin tone. Additionally, behavioral reactions manifest in infant's posture, tonality, and movements particularly facial expression that is a crucial marker of pain in infants (**Taplak & Bayat, 2021).** Furthermore, premature infants who are exposed to pain are at risk of developing emotional and learning impairments, as well as neuromuscular disability. Also, it may have long term developmental and psychological consequences including problems on neurodevelopment, brain development and function **(Hatfield et al., 2019).**

Therefore, a crucial concern in the neonatal intensive care unit is the pain management for preterm infants. It helps to lessen the infants' exposure to unpleasant interventions, lessen their perception of pain, and assist them in coping with the pain. **(Çelebioğlu & Üğücü, 2019). Fatollahzade et al., 2020** mentioned that every infant has the right of pain management. Nurses and other health care team members contribute significantly in the evaluation and management of pain with pharmacological and non-pharmacological methods. Pharmacological methods can help to cope with severe pain but may have risks and cause various symptoms to preterm infants such as nausea, physiological disturbance, respiratory depression, and seizures **(Peng et al., 2018).** Meanwhile, non-pharmacological approaches of managing discomfort are more successful because preterm infants can tolerate them well and they have a short acting time **(D'Agata et al., 2017).** Also, it is essential in reducing disruptions in preterm infant's developmental processes **(Yiğit & Altun, 2018).**

One of the most easy and economical non-pharmacological methods is Facilitated tucking **Gomes Neto et al., 2020).** It is a nursing intervention that entails holding the infant after warming the caregiver hands to provide tactile and thermal sensory stimulation to reduce pain during intrusive management (**Gomes Neto et al., 2020). Also, Peng et al., 2018** added that facilitated tucking is a non-pharmacological method that involves holding the infant in a flexed midline side-lying position while the caregiver places a hand on the infant's hand and feet.

Moreover, Facilitated tucking position helps the infant to cope with stressful extra-uterine life, use self-regulation skills & abilities and manage with slight and moderate pain & pressure **(Gomes Neto et al., 2020).** Also, **Yiğit & Altun, 2018** have revealed that the facilitated tucking position decreases discomfort and pain during invasive procedure. In addition, **Gomes Neto et al., 2020)** added that facilitated tucking is a procedure that helps infant's mimics being in the uterus. This enables the newborn to feel more safe and comfortable and respond in a controlled manner. It also improves self-regulation by reducing the physiologic reaction as increasing heart rate which causes the disequilibrium related to pain and stress. Additionally, it enhances emotional stability and lessens pain perception. For this reason, this study was aimed to examine the effect of facilitated tucking position on preterm infants' pain and suction duration during endotracheal suctioning.

Significance of the study:

Compared to full-term infants, preterm infants have less developed physical and physiological systems. They experience a great sense of separation from their parents while receiving care in the special therapeutic environment of the neonatal intensive care unit because of their immature organ systems, which also cause them to experience a variety of health issues such as feeding issues, respiratory failure, infections, and other issues. Additionally, preterm infants undergo a variety of unpleasant procedures daily for the first few weeks of their lives, and nearly 80% of them do not receive any type of pain management. **(Gomes Neto et al., 2020).**

The endotracheal suction painful responses of preterm infants to pain remained ignored. Also, preterm infants have no ability to express their feeling of pain and its intensity. So, a valid and reliable instrument must be utilized to assess the preterm infant's pain and the appropriate pain relief measures should be performed during routine procedures such as endotracheal suction. The facilitated tucking position is a comforting measure that lessens the preterm infant's procedural pain and guards against the long-term effects of frequent painful stimuli. So, this study was conducted to examine the effect of facilitated tucking position on preterm infants' pain and suction duration during endotracheal suctioning.

2. Methods

2.1. The aim of study

The aim of this study was to examine effect of facilitated tucking position on preterm infants' pain and suction duration during endotracheal suctioning. This aim achieved through:

a) Assessing the effect of facilitated tucking position on preterm infants' pain during endotracheal suction

b) Examining the effect of facilitated tucking position on preterm infants' endotracheal suction duration

c) Exploring the effect of facilitated tucking position on preterm infants' physiological stability during endotracheal suction

2.2. Research hypothesis:

a)The pain score of preterm infants during endotracheal suctioning in facilitated tucking position will be less than the pain score of preterm infants during endotracheal suctioning without facilitated tucking position.

b) Preterm infants who will be in facilitated tucking position during endotracheal suctioning would have more physiological stability than endotracheal suctioning without facilitated tucking position.

c)The endotracheal suction for preterm infants in facilitated tucking position will be less on duration than the endotracheal suction without facilitated tucking position.

2.3. Operational definition:

a) Preterm infant:-

Is an Infant who are delivered alive before 37 weeks of gestational age (World Health Organization, 2018). **While in this study, it is operationally defined as:** an infant who is born between 29 weeks of gestation and before the completion of 37 weeks of gestation.

b) Facilitated tucking position:

Is anon pharmacological approach in which the caregiver gently applying her hand on the infant's body, head, or feet to aid in tucking while giving flexion and control (Carey, 2021). **While in this study, it is operationally defined as:** holding the infant in a flexed midline side-lying position while placing the caregiver hand on the infant's hands and feet.

c) Endotracheal suction

Endotracheal suction is a frequent invasive caring procedure that used in patients with artificial airways to physically remove accumulated respiratory secretions and maintain patent airway (**Mwakanyanga et al., 2018**). **While in this study, it is operationally defined as:** applying a negative pressure to the endotracheal tube in order to remove the tracheobronchial secretion

2.4. Study design:

A randomized controlled crossover design was utilized to conduct the study.

Setting:

The study was conducted at Neonatal Intensive Care Units (NICUs) in El Gamea El Sharea Center and Shebin El-Koom Teaching Hospital at Shebin El-Koom City. Neonatal Intensive Care Units in Shebin El Kom Teaching Hospital composed of three rooms in the 3rd floor; each one contained eight incubators, two of them for neonates who were stable preterm infants and neonates who are suffering from neonatal hyperbilirubinemia and the other one for neonates with other condition. Neonatal Intensive Care Units in El Gamea El Sharea Center included four rooms in the 1st floor. Three rooms consisted of six incubators for all neonates and the fourth one contained five incubators for neonates suffering from neonatal hyperbilirubinemia.

Subjects:

Purposive random sample of 30 preterm infants were enrolled from the previously mentioned settings. Sample size (n) was estimated based on the formula: $n = p\ (1 - p) \times (z1-\alpha/2+ z1-\beta)\ 2 \div (p1 - p2)2$ with a confidence level of 0.95 and test power 80%. Where in this the sample size, $p = (p1 + p2) \div 2$, $p1 = 0.50$, $p2 = 0.34$. The estimated sample size was 44 participants; however, 14 infants were excluded due to referral to other hospital and infant's death. Each preterm infant who met the inclusion criteria was observed twice during endotracheal suctioning. One time of the observation was done during endotecheal suctioning according to routine care and the other time of the observation was done with placing the preterm infant in facilitated tucking position during endotecheal suctioning. The infants have been randomly sequencing to either with intervention and without intervention.

Inclusion Criteria :

Preterm infants were chosen according to the following inclusion criteria: gestational age between 29 and 36 weeks, weight 1200 grams or greater and have endotracheal intubation.

Exclusion Criteria

a) Preterm infants who have chest tube, congenital anomalies, intracranial hemorrhage higher than Grade II, seizures,

b) Preterm infants who received sedatives within four hours before the intervention

c) Preterm infants who exposed to any uncomfortable procedure for at least 30 minutes prior to the intervention.

Instruments-

Three instruments were utilized for data collection:

Instrument one: preterm infant's assessment sheet. It was designed by the researcher after reviewing related literature (Taplak & Bayat.,2021).). It composed of two parts:

- **Part one: Characteristics of preterm infants.** It included data about preterm infant's sex, age (gestational, postnatal) and method of delivery.
- **Part two: Baseline Clinical Characteristic.** It contained data related to weight and the fifth minute Apgar score.

Instrument two: Preterm Infant Pain Profile (PIPP). Preterm Infant Pain Profile was developed by Stevens et al., 1996. It was an observational checklist used to assess procedural pain (0-3). It contained seven items including gestational age, behavioral state, heart rate, oxygen saturation, brow Bulge, eye squeeze and nasolabial Furrow. The total pain score was the summation of all seven items with a minimum of 0 and maximum of 21. Zero to six scores indicated no pain whereas the score from seven to twelve indicated mild pain and scores higher than 12 indicated moderate to severe pain (Ballantyne et al., 1999 and Verklan et al., 2020). It was a valid scale designed to assess of procedural pain of preterm and term infants in clinical settings with high test-retest reliability A Pearson at 0.98.

Instrument three: Suction Duration assessment sheet. The researcher was designed it to assess and record duration of endotracheal suction per second for preterm infants with and without facilitated tucking position.

Ethical Considerations

The ethics committee approval on the subject of research was taken from the Faculty of Nursing, Menoufia University, Egypt. Also, the informed consent was obtained from the parents of the preterm infants after a complete description of the purpose, nature, and confidentiality of the study. All parents had the entire opportunity to withdraw at any moment and to decline to have their preterm included in the study.

Pilot Study

After the instruments were established and before the data collection began, a pilot study was conducted on 10% of the total sample—three preterm infants to assess the tools' application, practicability, consistency, clarity, and feasibility as well as to determine how long it will take to fill the tools. No essential adjustments were made. Consequently, the pilot study was added to the overall sample.

Procedure

a) Prior to data collection, a written consent to carry out the study was obtained from the director of each unit after explaining the purpose of the study and methods of data collection. a) Meetings were first held with unit managers to request permission to conduct the research and to explain its objectives and expected results. A special permission to record video for preterm infant during the painful procedure by the assistance of other researcher was obtained from the medical director of the units.

b) Data collection for this study was conducted for a period of 5 months extending from the 1st of October 2020 to the end of February 2021.

c) After selecting the subjects, the characteristics of preterm infants acquired from their medical records, which were then noted.

d) To evaluate the variation in pain response using the same preterm infants as controls. Each infants was examined in two different situation: (1) the typical endotracheal suctioning procedure (without intervention), and (2) the typical endotracheal suctioning procedure plus aided tucking (with intervention). Randomly, half of preterm infants were examined first in the endotracheal suctioning routine care without intervention, then in the intervention situation (the normal routine of endotracheal suctioning plus facilitated tucking). For the other half of the sample, the sequence of observations was reversed. Each infant was observed twice over the course of a 12-hour period. The observed endotracheal suctioning sessions were spaced no more than four hours apart and at least two hours apart. (Fig:1).

e) In cases where the infants received endotracheal suctioning alone without intervention, the staff nurse did the endotracheal suctioning, and the researcher just documented the study variables.

f) In cases where the infants received endotracheal suctioning along with intervention, the staff nurse performed the endotracheal suctioning while the researcher carried out the intervention.

g) During the intervention, the environment kept quit and avoid any stimuli. The researcher set video recording for the facial expression and behavioral state then assess and record heart rate and oxygen saturation through pulse oximeter attached to the infant for 30 second before suction.

h) After that warming hands and placing the infant in tucking position Fig (2). The premature infant was laid on his or her side, and then the back was gently bent, the legs flexed > 90°to the midline of the trunk then the shoulders were brought to the midline with elbows flexed > 90°, the hands were placed near the mouth or on the infant's face, while placing the caregiver hand on the infant's hands and feet. The chin was not lowered toward the chest and the degree of chin tucking depended on where the endotracheal tube was placed. The infant maintained in the tucking position throughout the suctioning and for 30-second after the procedure.

i) The researcher reassessed heart rate, oxygen saturation levels during this 30-second.

j) After that the researcher saw the recorded video for each infant, record suction duration and the score of PIPP.

Figure 1. The steps of the study

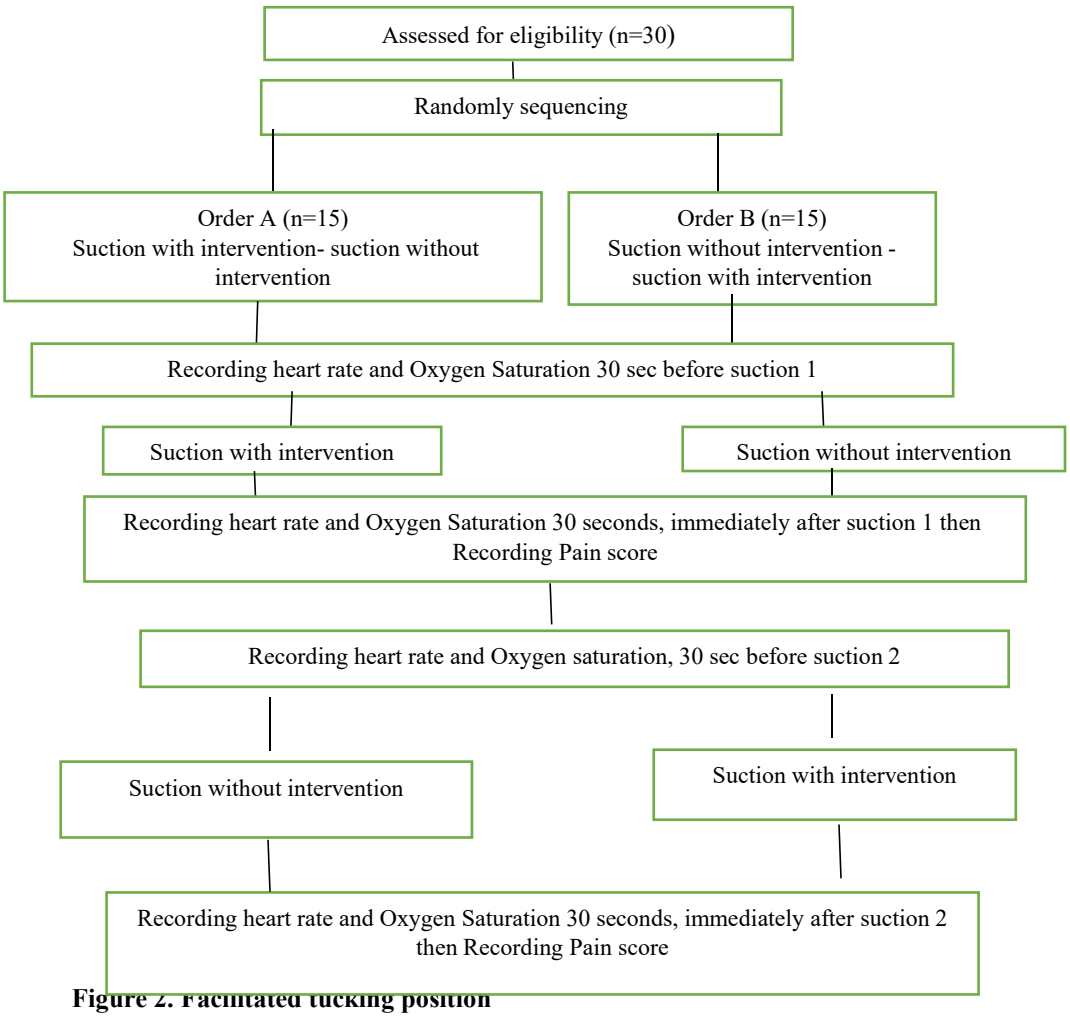

Figure 2. Facilitated tucking position

Ward-Larson, C. L. (2004). *The efficacy of facilitated tucking for relieving procedural pain of endotracheal suctioning in very low birth weight infants* (Doctoral dissertation, Saint Louis University).

Data analysis: -

Data was altered and coded in order to fit into a form that was specifically made for computer entry. Version 23 of the SPSS (Statistics Package for Social Science) statistical package was used for data entry and analysis.

In order to create the graphics, Excel was used. The t test was used to compare the two groups' quantitative data, which was expressed as mean and standard deviation (X SD). The Mann-Whitney U test is used to compare two independent groups, the ANOVA (f) test is used to compare three or more groups with quantitative variables, and the Kruskal-Wallis test is a nonparametric test used to compare three or more groups that are not normally distributed.

Number and percentage were used to express qualitative data (No & %). the chi-square test (X^2), and Fisher's exact test (if cell number was <5) were used to evaluate the data. Pearson's correlation was used to explain the relationship between a normally distributed quantitative variable. Level of significance was set at p value < 0.05 for all significant statistical tests.

Results

Table 1 represents characteristics of studied preterm infants. It was obvious that more than half of preterm infants (53.3%) were male. Concerning gestational age, it shows that 36.7% &33.3% of preterm infants were >36 and 32-35 weeks of gestation respectively. In addition, three quarters of them (76.7%) were from 1-7 days of postnatal age. Also, three quarters of them (70.0 %) delivered cesarean.

Table 2 illustrates distribution of preterm infants regarding to baseline clinical characteristics. In relation to preterm infants weight and their Apgar score, it was obvious that more than half of them (56.70%, 60.0% respectively) were 1200 -<1500 gm and had Apgar score 8-10 at 5-minute.

Table 3 clarifies mean duration of endotracheal suction among studied preterm infants with and without intervention. The mean and standard deviation of preterm infant's suction duration in the group with intervention were 14.60 ± 3.32 compared to 18.93 ± 4.37 in the group without intervention. Therefore, there was a highly statistically significant difference between studied preterm infants with and without intervention at 1% level of statistical significance.

Table 4 clarifies preterm infants' pain profile with and without intervention. It represents there was a statistically significant difference between preterm infant pain profile among the studied groups at 5% level of statistical significance.

Table 5 shows mean of total preterm infants pain profile with and without intervention. This table illustrated that studied preterm infants

with intervention had the lowest mean pain scores (9.20 ± 3.03 VS 13.03 ±3.10 respectively) than without intervention. Therefore, there was a highly statistically significant difference between preterm infants pain profile among the studied groups at 1% level of statistical significance. Fig 3 shows percentage distribution of PIPP among the studied groups. It revealed that more than half of preterm infants (56.7%) with intervention have mild pain meanwhile more than half of preterm infants (53.3%) without intervention have moderate to severe pain. Therefore, there was a highly statistical significant difference between preterm infants pain profile among the studied preterm infants at 1% level of statistical significance.

Fig 4 shows Mean of maximum heart rate and minimum O2 saturation level among preterm infants with and without intervention. This figure illustrated that preterm infants with intervention had more stability of maximum heart rate and minimum O2 saturation (9.96 & 3.73 respectively) compared to preterm infants without intervention (16.80 & 5.93 respectively). Therefore, there was a highly statistical significant difference between maximum heart rate and minimum O2 saturation among the studied groups at 1% level of statistical significance.

figure 4 illustrates correlation between PIPP and suction duration among the studied preterm infants. There was a highly statistically significant positive correlation between PIPP and suction duration among the studied preterm infants.

Table 6 illustrates the relation between PIPP and characteristics of the studied groups. It was clear that there was no statistically significant relation between PIPP and characteristics of the studied groups.

Table (1): Characteristics of studied preterm infants (n=30)

Demographic characters	No. (n=30)	% (100%)
Sex		
▪ Male	16	53.3
▪ Female	14	46.7
Gestational age		
▪ >36 weeks	11	36.7
▪ 32-35 weeks	10	33.3
▪ 28-31 weeks	6	20.0
▪ <27 weeks	3	10.0
Postnatal Age		
▪ 1-7 days	23	76.7
▪ 8-14 days	5	16.7
▪ ≥15	2	6.7
Type of delivery		
▪ Normal	9	30.0
▪ Cesarean	21	70.0

Table (2) Distribution of preterm infants regarding to baseline clinical characteristics (n=30)

Clinical characteristics	No. (n=30)	% (100%)
Weight		
▪ 1200 - <1500	17	56.7
▪ 1500-2500	13	43.3
5-minute Apgar score		
▪ 4-5	4	13.3
▪ 6-7	8	26.7
▪ 8-10	18	60.0

Table (3): Mean duration of endotracheal suction among studied preterm infants with and without intervention (n=30)

Studied variables	With intervention	Without intervention	t-test	P value
Suction duration				
Mean ±SD	14.60 ± 3.32	18.93 ± 4.37	4.31	**0.000****

NB: ** Highly statistically significant difference P<0.001

Table (4) Preterm infants pain profile with and without intervention

Studied variables	With intervention		Without intervention		χ2	P value
	NO	%	NO	%		
Behavioral state						
• Quiet/sleep	4	13.3	0	0.0	14.05	.003*
• Quite/awake	13	43.3	4	13.3		
• Active/sleep	11	36.7	18	60.0		
• Active/awake	2	6.7	8	26.7		
Heart rate max						
• 0-4 b/m increase	7	23.3	0	0.0	12.45	.006*
• 5-14 b/m increase	16	53.3	12	40.0		
• 15-24 b/m increase	5	16.7	12	40.0		
• >25 b/m increase	2	6.7	6	20.0		
O2 saturation min						
• 0-2.4% decrease	3	10.0	0	0.0	17.45	.001*
• 2.5-4.9% decrease	17	56.7	5	16.7		
• 5-7.4% decrease	10	33.3	21	70.0		
• >7.5% decrease	0	0.0	4	13.3		
Brow bulge						
• None	2	6.7	0	0.0		
• Minimum	11	36.7	4	13.3	11.70	.008*
• Moderate	16	53.3	17	56.7		
• Maximum	1	3.3	9	30.0		
Eye Squeeze						
• None	1	3.3	0	0.0		
• Minimum	13	43.3	8	26.7	11.50	.009*
• Moderate	16	53.3	13	43.3		
• Maximum	0	0.0	9	30.0		
Nasolabial furrow						
• None	3	10.0	0	0.0		
• Minimum	15	50.0	8	26.7	13.28	.004*
• Moderate	12	40.0	14	46.7		
• Maximum	0	0.0	8	26.7		

* Statistically significant difference P<0.05

Table (5) Mean of total preterm infant pain profile with and without intervention

Studied variables	with intervention	Without intervention	t-test	P value
PIPP				
Mean ±SD	9.20 ±3.03	13.03 ±3.10	4.84	0.00**

N.B: χ2: Chi-Square test ** Highly statistically significant difference P<0.001

Fig (3) Percentage distribution of PIPP among the studied preterm infants with and without intervention

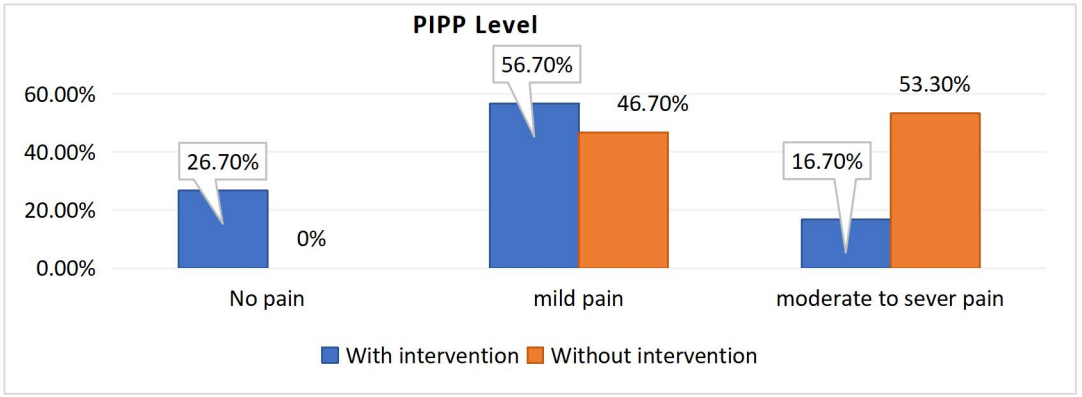

Fig (4): Mean of maximum heart rate and minimum O2 saturation level among preterm infants with and without intervention

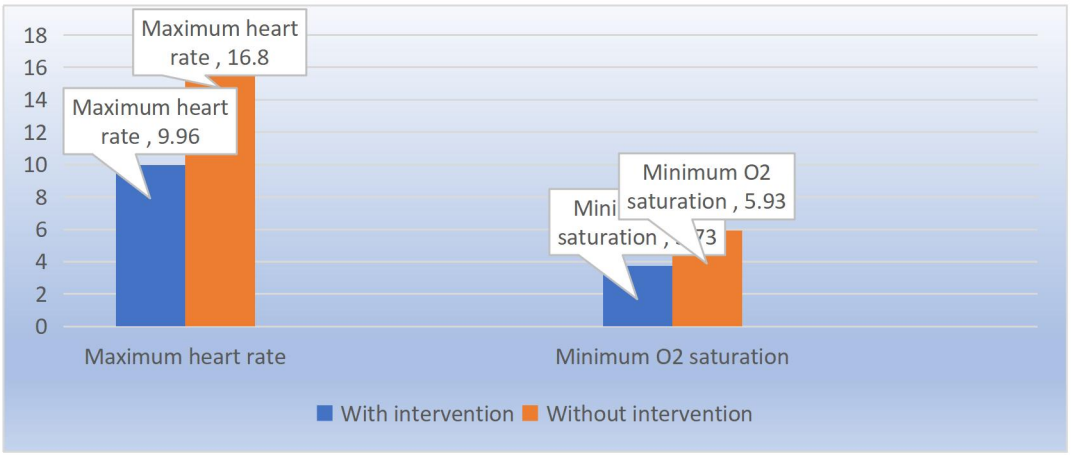

Fig (5) Correlation between PIPP and suction duration among the studied preterm infants

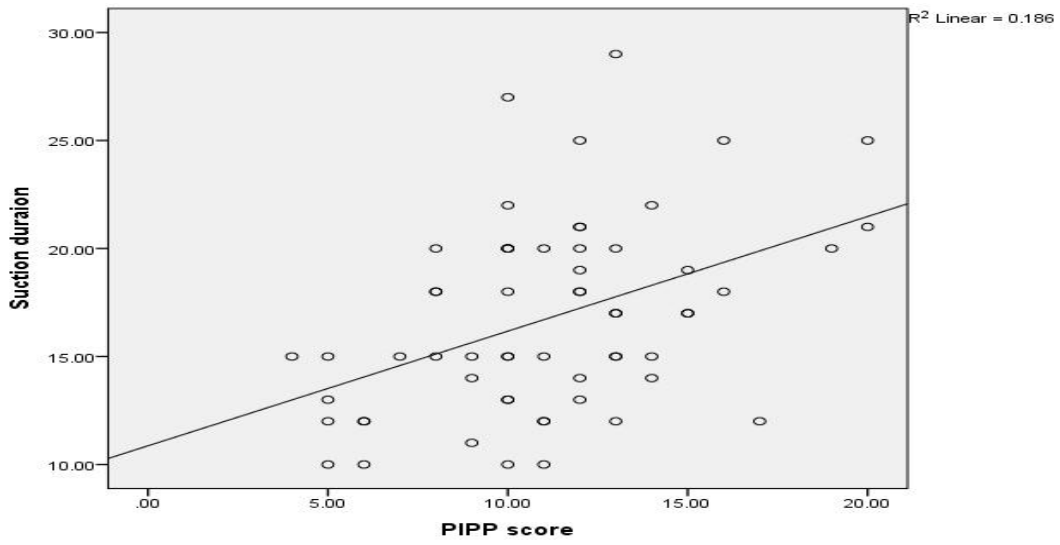

Table (6): Relation between PIPP and characteristics of the studied prterm infants

Socio demographic characters	PIPP Mean ±SD	Test of sig.	p value
Sex			
▪ Male	10.90 ± 3.54	**t-test**	0.63
▪ Female	11.35 ± 3.72	4.80	
Gestational age			
▪ >36 weeks	10.66 ± 3.30	**t-test**	
▪ 32-35 weeks	11.79 ± 3.98	1.18	0.23
▪ 28-31 weeks	10.33± 3.20		
▪ <27 weeks	11.65± 2.50		
Postnatal Age		**F**	
▪ 1-7 days	11.32 ± 3.94		
▪ 8-14 days	10.60 ±2.45	0.36	0.69
▪ ≥15	10.0 ± 0.00		
Weigh		**t-test**	
▪ <1500	10.79 ± 3.37	0.79	0.44
▪ 1500-2500	11.53 ± 3.91		
Type of delivery			
▪ Normal	11.66 ± 2.22	**t-test**	
▪ Cesarean	10.88 ± 4.05	0.96	0.34
5-minute Apgar score			
▪ 4-5		**K**	
▪ 6-7	10.12 ± 3.52		
▪ 8-10	10.00 ± 3.44	4.67	0.09
	11.83 ± 3.60		

N.B: F: ANOVA test K:Kruskal Wallis test

Discussion:

Endotracheal suctions are commonly used in neonatal intensive care unit. It may be increased pain level and changes in hemodynamic state. These physiological responses may cause increased stress **(Slater et al., 2012).** Early pain and stress exposure in preterm newborns has the capacity to change the brain structure and function over time. Therefore, nurses and health care provider should manage this condition effectively. The facilitated tucking position improves the preterm infant ability to keep autonomic, physiological, and motor systems stable. more effectively **(Gomes Neto et al., 2020).**

In relation to hypothesis one: The pain score of preterm infants during endotracheal suctioning in facilitated tucking position will be less than the pain score of preterm infants during endotracheal suctioning without facilitated tucking position. According to the current study, more than half of preterm infants with intervention have mild pain meanwhile more than half of preterm infants without intervention have moderate to severe pain. From the researcher's opinion, this could be due to the facilitated tucking position with invasive procedures mimicked a relaxing environment of being in uterus and secured them with controlled responses to painful stimuli. This result agreed with **Taplak & Bayat (2021),** they mentioned that compared to control groups, the preterm infants' group with aided tucking experienced less discomfort and recovered quickly.

Also, **Cirik & Efe, (2020)** they stated that the use of facilitated tucking alone or combined with other non-pharmacological method was efficient in minimizing infants' pain profile score than routine care. In addition, **Ranjbar et al. (2020),** they mentioned that facilitated tucking is more efficient in decreasing the pain during blood sampling in infants as compared to control group. Moreover, **Fatollahzade, (2020)** they reported that preterm infant's pain due to suctioning is significantly lessened by placing them in a lying position with gentle flexion and gentile human touch. A study conducted by **Rubin Selvarani, (2016),**

they stated that facilitated tucking position will decreases the preterm infants pain level during painful procedures. In the same context, **Kucukoglu, (2015),** they mentioned that facilitated tucking position is an easy, non-pharmacological approach which reduces pain during painful procedures.

Also, **Alinejad-Naeini et al., (2014),** they indicated that the facilitated tucking position is a secure non-pharmacological technique for controlling procedure pain. In addition, **Sundaram, et al., (2013),** they stated that the majority of preterm infants who were not in facilitated tucking position had severe pain during painful procedures but very few of them had severe pain during painful procedures with facilitated tucking position. Moreover, **Lopez, (2015)** illustrated that facilitated tucking can relieve pain during painful procedure. As a result, when necessary, nurses must be able to do facilitated tucking. Furthermore, **Liaw et al., (2012),** they stated that facilitated tucking showed broader effects on relieving preterm infants' pain during heel-stick procedures.

A study conducted by **Axelin, A et al., (2006),** demonstrated that facilitated tucking position by parents during endotracheal suctioning of preterm newborns is an efficient and secure strategy for pain management. Also, **Ward-Larson, (2004),** revealed that the pain profile score of the preterm infants who placed in a facilitated tucking position during the suctioning technique were much lower. On the other hand, the result was inconsistent with a study conducted by **Peng et al., (2018),** they mentioned that while facilitated tucking alone might not be able to greatly lessen infant's pain, it might be able to speed up recovery and stabilize their condition. Meanwhile using facilitated tucking in combination with sucking and breast milk can help to alleviate pain in preterm infants during painful procedures.

Regarding hypothesis two: Preterm infants who will be in facilitated tucking position during endotracheal suctioning would have more physiological stability than endotracheal suctioning without facilitated tucking position. The current study illustrated that, a highly statistically significant difference between the investigated preterm infants was found regarding maximum heart rate and minimum O2 saturation with and without intervention at 1% level of statistical significance. This might be due to facilitated tucking position which reduces stress and pressure caused by procedural discomfort & pain and enhance the auto-regulation mechanisms that maintain physiological and behavioural factors under control. This result agreed with **Cirik & Efe, (2020),** they stated that the use of facilitated tucking alone or combined with other nonpharmacological methods during orogastric tube insertion was more effective in improving physiological variables as decrease heart rate and oxygen saturation consumption than routine care. Also, **Fatollahzade et al., (2020),** they reported that the infants decreased oxygen consumption when placed in a lying position with gentle flexion and gentile human touch. In addition, **Peyrovi et al., (2014)** they founded that preterm infants' heart rates were successfully stabilized after being helped to tuck during the endotracheal suction procedure. Also, **Liaw, (2012),** they showed that facilitated tucking during painful procedures significantly enhanced the preterm infants' physiological homeostasis by decreasing abnormal heart rate and stabilizing oxygen saturation. In addition, **Herrington, (2007),** they mentioned that the aided tucking group's heart rates significantly dropped both during and following the procedure. Moreover, **Corff et al., (1995),** they identified that infants demonstrated a lower mean heart rate with facilitated tucking position than without facilitated tucking position.

On the contrary this finding was inconsistent with **Taplak & Bayat, (2021),** they stated that no statistically significant differences were found between facilitated tucking, and control groups in terms of the mean heart rate and O2 saturation values. Also, **Axelin et al., (2006),** they founded that the statistically differences regarding the heart rate and oxygen saturation values between facilitated tucking, and control groups were not significant.

In relation to hypothesis three: The endotracheal suction for preterm infants in facilitated tucking position will be less on duration than the endotracheal suction without facilitated tucking position. The current study

clarified that the endotracheal suction in preterm infants with intervention was less in duration of suctioning than in the preterm infants without intervention. This could be due to preterm infants calmed down more quickly after facilitated tucking position that helps the infant to be more relaxed during endotracheal suction and reduces their response to pain. Also, it helps the nurse to perform the endotracheal suction without interruption and more quickly. This findings was consistant with **Axelin, et al., (2006),** they showed that the suctioning duration was various between the two groups as the average suction time for preterm infant with facilitated tucking position by parents was lower than control group. Also, **Peyrovi et al., 2014,** they mentioned that the intervention group with facilitated tucking position took less time on average than the non-intervention group to reach the pain level of one.

On the contrary, a study conducted by **Rubin, (2016),** reported that the duration of the painful suction procedure was similar in the intervention with facilitated tucking position and control group without facilitated tucking position.

Conclusion

According the results of this study, it was concluded that Preterm infants who were in facilitated tucking position during endotracheal suctioning experienced more physiological stability, lower pain score and shorter suction duration compared to preterm infants who was received routine endotracheal suctioning facilitated tucking position.

Recommendations

The following recommendations can be made in light of the study's findings:

1. Facilitated tucking position could be included in standard daily care during painful procedures for preterm infants.
2. Hospital polices at NICUs should include the provision of simple non-pharmacological methods as facilitated tucking position during painful procedures to provide comfort and reduce pain
3. This study needs to be applied on larger sample of preterm infants and at different study settings to ensure the generalizability of results.

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