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Effect of Facilitated Tucking Versus Swaddling Positions on Orogastric Tube Insertion Pain amongPreterm Neonates

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Abstract
Background*: Preterm neonates admitted in the Neonatal Intensive Care Unit (NICU) are exposed to a variety of diagnostic and therapeutic painful procedures as orogastric tube (OGT) insertion. Pain evokes negative physiological and behavioral responses. Consequently, it leads to short and long term detrimental complications. So, it is reasonable to address their pain by incorporating developmental supportive positions as facilitated tucking and swaddling.****Objective:*** *The aim of this study was to determine the effect of facilitated tucking versus swaddling positions on OGT insertion pain among preterm neonates.* ***ResearchDesign****: A quasi-experimentalresearchdesignwasused.* ***Setting****:This study was conducted at the NICU of Maternity University Hospital at El-Shatby in Alexandria.****Subjects****: A convenient sample of 90 preterm neonates who fulfilled the following criteria comprised the study subjects: Postnatal age 2 days till is less than 2 months of age, being fed viaOGT,connected with pulse oximeter,free from congenital or neurological malformations, APGAR score more than 7, calm, clinically stable and did not receive any sedatives or analgesics.****Tools****: Two tools were used to collect necessary data, namely: Characteristics and Medical History of Preterm Neonates and Premature Infant Pain Profile (PIPP).****Results****: The main study findings showed that the score recorded for the majority of preterm neonates either in the facilitated tucking or swaddling groups was less than or equal 6 it means that OGT insertion did not cause any pain (90.9% and 83.3% respectively) compared to only 20.0% of those in the control group. Moreover, 73.3% of preterm neonates in the control group obtained 7-12 pain score.Hence, they had slight to moderate pain during OGT insertion. There were statistical significant differences detected among preterm neonates in the facilitated tucking group and the control group as well as among those in the swaddling group and the control group* ***(P=0.000 for each)***. ***Conclusion****: It can be concluded that facilitated tucking and swaddling positionswere effective in reducing preterm neonates' pain during and afterOGT insertion. Moreover, preterm neonates in facilitated tucking group experienced slightly less pain than those in the swaddling group.* ***Recommendation:*** *The main recommendation of the current study wasNICU nurses should use facilitated tucking and swaddling positions as non-pharmacological interventions to reduce preterm neonates' pain who are exposed to a variety of painful procedures as OGT insertion.*

Keywords: *Facilitated Tucking Position; Swaddling Position; Preterm Neonates; Orogastric Tube Insertion; Pain.*

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I. Introduction

Globally, more than 1 of 10 neonates were born prematurely according to the World Health Organization report (2016) [(1)]. In the United States (US) preterm birth rate rose slightly from 9.57% in 2014 to 9.63% in 2015 [(2)].Prematurity interrupts the neonates' intrauterine growth and development and interferes with their adaptation to the extra-uterine life. As such, they are hospitalized in a comparatively hostile environment of the Neonatal Intensive Care Units (NICUs) where they undergo numerous diagnostic and therapeutic procedures that are essential to guarantee their survival [(3)]. Preterm neonates are liable to different health problems, such as, hypoglycemia and respiratory distress syndrome. Those problems may interfere with oral feeding. Additionally, those neonates have deficient feeding skills as ability to latch, suck effectively, and coordinate sucking and swallowing with breathing. Hence, it is important to resort to other appropriate feeding method as Orogastric/Nasogastric (OG/NG) tube feeding for obtaining adequate nourishment [(4)].

Worldwide, the indication of OG/NG tube feeding among preterm neonates has reached almost to 60% in 2010 [(5)]. In the US, it was reported that 66% out of 1316 OG/NG tube insertion was carried out for the purpose of feeding in 2015 [(6)].Unfortunately, frequent reinsertion of feeding tube may be required if it is accidentally extubated or becomes obstructed. Experts in neonatal pain have documented that feeding tube insertion is a painful procedure and they rated the severity of its pain as moderate [(7,8)].

This painful insult occurs during the critical window of brain development and exposes preterm neonates to potentially long-term developmental problems later in childhood. They are more sensitive to pain as they have lower tolerability threshold and lack the ability to express, cope with and manage pain effectively [(9)]. So, attention should be paid to the two main indicators of pain namely; the physiological and behavioral indicators. Physiological indicators as changes in heart rate, respiratory rate and oxygen saturation. While, behavioral indicators as crying and change in facial expressions [(4)]. Proper pain management requires competent pain assessment tool. The Premature Infant Pain Profile (PIPP) scale is the standard tool for assessment of pain for preterm and term neonates less than 2 months of age. It is a physiological and behavioral observational tool for acute and procedural pain [(10)].

Management of pain can be accomplished using pharmacological and non-pharmacological interventions. Administration of analgesics is controversial in neonates due to the potential detrimental side effects. While, non-pharmacological interventions are accessible, inexpensive and have shown varying degrees of efficacy. Indeed, these interventions can be categorized into nutritive as oral sweet solution, maternal interventions as kangaroo mother care and sensory stimulation as music and developmental supportive positioning [(11)].

The concept of developmental supportive care encompasses a multiple strategies such as facilitated tucking and swaddling positions which are designed to reduce stress in the NICU [(12)]. Facilitated tucking position is carried out by holding the neonates in the side-lying, flexed fetal-type position by bringing the body to middle holding the upper and lower extremities of the neonates in flexion with hands. The effect of this position during painful procedures has been shown to significantly diminish the magnitude of physiological and behavioral pain response. Generally, when preterm neonates are in pain, they usually respond to holding because they feel reassured. Simply, touch stimulates pressure receptors which in turn stimulate the vagal nerve and increase its activity. Subsequently, it leads to relaxed general behavior [(13)].

Swaddling is another developmental supportive position that reduces an expenditure of energy through reduction of movements of the neonates. So, reducing the stress caused by motor disorganization associated with stimuli and decrease their physiological stimulation. Swaddling is securely wrapping bare neonates with a sheet or a fabric in flexed fetal-type position, with their lower limbs flexed and keeping the head, shoulders and hips at a neutral position.Arms are placed close to neonates torso with both hands clasped.Currently, it is becoming increasingly popular as a mean of soothing irritable neonates and helping them sleep longer [(14)].

Care of preterm neonates during painful procedures such as NG/OG tube insertion is an exciting challenge for NICUs nurses. Therefore, the neonatal nurses have a pivotal role in pain assessment, management and prevention in order to prevent its adverse effects. Neonatal nurses should use facilitated tucking and swaddling positions in an effective and safe manner to relieve neonatal pain [(15)]. Researches addressing the incorporation of these positions in NICUs during painful procedures are limited. Hopefully, the present study would implement a developmental supportive positioning approach that could decrease the preterm neonates' pain response in NICUs.

This study aimed to:

Determine the effect of facilitated tucking versus swaddling positions on orogastric tube insertion pain among preterm neonates.

Research Hypotheses:

1. Preterm neonates who receive either facilitated tucking or swaddling interventions exhibit lower pain score during Orogastric Tube (OGT) insertion than those who do not.
2. Preterm neonates who receive facilitated tucking intervention exhibit lower pain score during OGT insertion than those who receive swaddling intervention.

Operational Definitions:

- **Facilitated tucking position**: It refers to holding the preterm neonate in the side-lying, flexed fetal-type position bybringing the body to middle position by placing one cupped hand on the posterior side of the neonate's head. The other cupped hand is placed on the neonate's buttocks using gentle hand pressure.
- **Swaddling position**: It refers to placing the bare preterm neonate with clean diaper in supine position andsecurely wrapping him in a sheet or a fabric cloth in flexed fetal-type position with their lower limbs flexed and keeping the head, shoulders and hips at a neutral position.Arms are placed close to his torso with both hands clasped to prevent neonate'sarms from moving around excessively.

II. Materials and Method

Materials

Research Design

A quasi experimental research design was used to accomplish this study.

Setting

The study was conducted in the Neonatal Intensive Care Unit (NICU) of Maternity University Hospital at El-Shatby in Alexandria.

Subjects

- A convenient sample of 90 preterm neonates who fulfilled the following criteria comprised the study subjects:
- Postnatal age: two days after delivery to allow for resolution of analgesia or anesthesia received by their mothers during labor till before 2 months of age.
- Being fed via OGT.
- Free from congenital or neurological malformations.
- APGAR score more than 7.
- Did not receive any sedatives or analgesics.
- Calm and clinically stable.
- Being attached with pulse oximeter.
- Sample size was estimated according to Epi-Info program using the following parameters:
- Population size =121 preterm neonates
- Expected frequency = 50%
- Acceptable error =10%
- Confidence coefficient =95%
- Minimum sample size = 72 preterm neonates
- Preterm neonates were randomly divided into three equal groups. Each group consisted of 30 preterm neonates as follows:
- **The facilitated tuckinggroup**: where preterm neonates received facilitated tuckingintervention in addition to routine care of the NICU.
- **The swaddlinggroup:** where preterm neonates received swaddlingintervention in addition to routine care of the NICU.
- **The control group**: where preterm neonates received the NICU routine care only.
- Preterm neonates of the control group were chosen first and neonates of the two other groups were chosen alternatively.

Tools

Two tools were used to collect the necessary data.

Tool one: Characteristics and Medical History of Preterm Neonates

This tool was developed by the researcher to assess preterm neonates'characteristics andtheir medical history. It included two parts:

Part I: Characteristics of Preterm Neonates,such asage, gender, gestational age and body weight.

Part II: Medical History of Preterm Neonates, such as,type of delivery, date of admission and current diagnosis.

Tool Two: **Premature Infant Pain Profile (PIPP)**:

It was adopted from by Steven et al (1996)[16]. It is a bio-behavioral observational tool for acute and procedural pain assessment for premature neonate. It involves seven indicators as follow: gestational age, behavioral state, increase in heart rate, decline in oxygen saturation, brow bulge, eye squeeze, and nasolabial furrow.

Each of these items are measured on a four-points likertscale ranged from (0–3) as follow:

1- Gestational age:
   - 36 weeks or more = 0
   - 32 to 35weeks + 6 days = 1
   - 28 to 31 weeks + 6 days = 2
   - less than 28 weeks = 3

2- Behavioral state:
   - Active, awake, eyes open, facial movements = 0
   - Quiet, awake, eyes open, no facial movements = 1
   - Active, awake, eyes closed, facial movements = 2
   - Quiet, asleep ,eyes closed, no facial movements = 3
3- Increase in heart rate:
   - From 0-4 beats per minute.
   - Form 5-14 beats per minute.
   - From 15-24 beats per minute.
   - From 25 beats per minute and more.
4- Decrease in oxygen saturation:
   - No desaturation "0-2.4%" decrease.
   - Slight desaturation "2.5%- 4.9%" decrease.
   - Moderate desaturation "5%-7.4%" decrease.
   - Severe desaturation 7.5% decrease and more.
5- Facial changes (brow bulge, eye squeeze, and nasolabial furrow)
   - None = 0
   - Minimum = 1
   - Moderate = 2
   - Maximum =3

The total score of PIPP is the SUM of points for all seven indicators. It is ranged from 0-21. The higher the score the greater the pain behavior. **A score** from **0-6** represents no pain, **a score** from **7-12** represents slight to moderate pain. While, a **score >12** indicates severe pain.

Method

1- An official approval for conducting the study was obtained from the director of the NICU of Maternity University Hospital at El-Shatby in Alexandria after explaining the aim of the study.
2- Tool one was developed by the researcher.
3- Content validity of the tools was done by five experts in the pediatric nursing field.
4- A pilot study was carried out on 9 preterm neonates to test the applicability and clarity of the tools and no modifications were done. Those neonates were excluded from the study subjects.
5- The researcher attended both morning and evening shifts for data collection.
6- Subjects were assigned into three groups. Facilitated tucking group received facilitated tucking intervention, swaddling group received swaddling intervention and control group received routine NICU care.
7- Data concerning characteristics and medical history of each preterm neonate in the three groups were assessed using tool one.
8- **Initially before OG tube insertion**,**pain was assessed** for each preterm neonate in the three groups as **baseline data** after being attached to pulse oximeter using tool two as follows.

A: The researcher took the gestational age that was estimated by the neonatologistfor all preterm neonates from the neonatal records.

B:The researcher assessed and scored the **behavioral state**and **facial expression** ((brow bulge, eye squeeze, and nasolabial furrow) by observing the preterm neonate for **15 seconds**[16].

C- Heart rate and oxygen saturation were taken from pulse oximeterand**recorded.**

9-**Then, facilitated tucking or swaddling position** was applied for 10 minutes before OGT insertion and continued throughout the procedure and 2 minutes later after insertion.

10-**Facilitated tucking position was implemented as follows:**

- The preterm neonate was placed and holded by the researcher in the side-lying flexed fetal-type position.
- After that, one cupped hand of the researcher was placed on the posterior side of the preterm neonate's head, while the other cupped hand was placed on the preterm neonate's buttocks using gentle hand pressure[17].

11-**Swaddling position was carried out as follows:**

- The preterm neonate was placed in a supine position.

- The bare preterm neonate was securely wrapped in a thin sheet or fabric cloth in flexed fetal-type position with a clean diaper by the researcher.
- The arms of the preterm neonate were placed close to his torso with both hands clasped.
- The lower limbs of the preterm neonate were kept flexed and the head, shoulders and hips were kept at a neutral position.
- The upper and lower ends of the wrap were kept open, and the upper rim was aligned with the shoulder of the preterm neonate.
- The horizontal ends of the wrap were folded in opposite directions to cover the torso of the preterm neonate.
- The tightness of the swaddle was examined to ensure a comfortable fit, without restraining limb movements.
- An appropriate space was retained at the foot of the wrap before folding it.
- The remaining portion of the wrap was then folded into the back and secured by the body weight of the preterm neonate with one foot sticking out of sheet for being attached the sensor probe of the pulse oximeter [(18)].

12-For the control group: The control group received the routine care of the NICU only.

13-Every preterm neonate in the three groups was submitted to OGT insertion by theassigned nurse.
14-**Pain was reassessed during and immediately afterOGT insertion** for all preterm neonates in the three groups using PIPP scale as mentioned before by observing every preterm neonate for **30 seconds**[(16)].
15-The data concerning pain assessment before, during as well as immediately after OGT insertion was recorded by the researcher. This was done immediately after the period of observation for preterm neonates in both swaddling and control groups in addition to pain assessment only before OGT insertion for preterm neonates in the **facilitated tucking group.**
16-For thefacilitated tucking group, the researcher held the preterm neonateinfacilitated tucking position, observed and reassessed pain. Meanwhile, another trained nurse assisted her in recording the assessed data during and immediately after OGT insertion.
17-A comparison between the three groups was done to determine the effect of facilitated tucking versus swaddling positions on minimizing preterm neonatal pain.
18-Data were collected over a period of 6 months started from January to June 2018.

Ethical considerations:

- Written informed consents were obtained from the neonates' parents after explaining the aim of the study.
- They have the right to refuse to participate or to withdraw from the study at any time.
- They were assured about the confidentiality of the collected data.

Statistical Analysis

Data collected was coded and transferred into specially designed formats to be suitable for computer feeding. The Statistical Package for Social Sciences (SPSS version 21) was utilized for both data presentation and statistical analysis of the results. Categorical data were expressed in the form of frequencies and percentages. Numeric data were expressed in the form of minimum, maximum, mean and standard deviation (SD). Chi-square test and Fisher's Exact test were used to test the significance of results of qualitative variables.

- The 0.05 level was used as the cut off value for statistical significance**.**

III. Results

Table 1 illustrates the characteristics of the preterm neonates. Regarding the gestational age, it was obvious that highest percentages of preterm neonates in the facilitated tucking and swaddling groups as well as those in the control group were between 32 to less than 37 weeks of gestation i.e. late preterm neonates (86.7%, 83.3% and 90.0% respectively). Their mean gestational ages were 34.5±4.55, 34±5.08 and 34.7±4.51weeks respectively. Female preterm neonates constituted 56.7%, 53.3% and 63.3% among the facilitated tucking group, the swaddling group and the control group respectively. The same table revealed that preterm neonates who weighted 2000 to less than 3000 grams constituted 66.7% in the facilitated tucking group, 56.7% in the swaddling group and 63.3% in the control group. Their mean weights were 2.5±0.6, 2.2±0.3 and 2.4± 0.5 grams respectively. There were no statistical significant differences among the preterm neonates in the three groups.

Table 2 portrays the medical history of the preterm neonates. It was found that the most common diagnosis encountered by preterm neonates in facilitated tucking group, swaddling group and control group was hyperbilirubinemia (63.3%, 60.0% and 50.0% respectively). The table also illustrated that 76.7%, 70.0% and 66.7% of preterm neonates among the facilitated tucking group, the swaddling group and the control group were

delivered by cesarean section respectively.No statistical significant differences detected among the preterm neonates in the three groups.

Effect of facilitated tucking and swaddling positions on preterm neonates' behavioral state before, during and immediately after OGT insertion was clarified in Table 3. Before OGT insertion, it was reflectedthat almost similar percentages of pretermneonates in the facilitated tucking group, the swaddling group and the control group were active sleeper, their eyes were closed and had facial movements(63.3%, 60.0% and 63.3% respectively). During OGT insertion, the same behavioral state was noticed among preterm neonates in the facilitated tucking and swaddling groupsas well as those in the control group but, its percentage has decreased to 46.7%, 43.3% and 46.7% respectively.

Immediately after OGT insertion, the same behavioral state was also recognized among preterm neonates that has increased again to approximately similar percentages in the facilitated tucking group, the swaddlinggroup and the control group (56.7%, 53.3% and 53.3% respectively). The differences were not statistically significant among the preterm neonates' behavioral state in the three groups.

Table 4 shows the effect of facilitated tucking and swaddling positions on preterm neonates' heart ratesbefore, during and immediately after OGT insertion. It was apparent before OGT insertion that all preterm neonates in the three groups experienced slight increase in their heart rates from 0-4 beats per minute(100% for each). During OGT insertion, it wasobvious that the highest percentages of preterm neonates either in facilitated tucking or swaddling groups had also slight increase in their heart rates from 0-4 beats per minute (86.7% and 83.3% respectively). On the other hand, more than half of those in the control group (56.7%) exhibited an increase in their heart rates from 5 –14 beats per minute. There were statistical significant differences evident among preterm neonates in facilitated tucking and control groups as well as amongthose in swaddling and control groups (P=0.000 for each).

Immediately after OGT insertion, it was found that the all preterm neonates in facilitated tucking group, 96.7% in the swaddling group and 86.7% of those in the control group demonstrated slight increase in their heart rates. The differences were not statistically significant among each two groups.

Table 5: represents the effect of facilitated tucking and swaddling positions on preterm neonates' oxygen saturation before, during and immediately after OGT insertion. It can be seen form this table that before OGT insertion, desaturation was not detected among any preterm neonate of the three groups i.e. there was a slight reduction in the oxygen saturation from zero to 2.4%(100% for each). During OGT insertion, it is revealed thatoxygen desaturation was not recognized among the vast majority of preterm neonates in facilitated tucking group and the swaddling group (93.3% and 86.7% respectively).Conversely, around three quarters (73.3%) of preterm neonates in the control group exhibited moderate decline in their oxygen saturation "from 5 to 7.4% decrease". The differences were statistically significant among the preterm neonates in facilitated tucking group and the control group in addition to among those in the swaddling group and the control group (P=0.000 for each).

Amazingly, all preterm neonates in the facilitated tucking group and the highest proportion of those in the swaddling group did not show oxygen desaturation (100% and 90.0% respectively). While, slight decline in oxygen saturation was recognized among 86.7% of preterm neonates in the control group. The differences were statistically significant among the preterm neonates in facilitated tucking group and the control group as well as among those in the swaddling group and the control group (P=0.000 for each).

Table 6: reveals the total percent score of pain perceived by preterm neonates in the facilitated tucking group, the swaddling group and the control group. It was found that all preterm neonates in the three groups had no pain before OGT insertion (100% for each). During OGT insertion, it is obvious that the score recorded for the majority of preterm neonates either in the facilitated tucking or swaddling groups was less than or equal 6 it means that OGT insertion did not cause any pain (90.0% and 83.3% respectively) compared to only 20.0% of those in the control group.Moreover, it is reflected that 73.3% of preterm neonatesin the control group obtained 7-12 pain score.Hence, they had slight to moderate pain during OGT insertion. There were statistical significant differences evident among preterm neonates in the facilitated tucking group and the control group in addition to among those inthe swaddling group and the control group (P=0.000 for each).It is also clear from this table that the mean PIPP score was 8± 2.13 in the control group compared to 3±2.13 in the facilitated tucking group and 4 ± 2.65 in the swaddling group. Immediately after OGT insertion, it was found that the percentage of experiencing no pain among preterm neonates in the facilitated tucking and the swaddling groups as well as among those in the control group has reached to 100.0%, 96.7% and 86.7% respectively. Additionally, the mean PIPP score reduced to 5±3.12 in the control group, while it remained the same for the facilitated tucking and the swaddling groups. The differences were not statistically significant between each two groups.

IV. Discussion

Preterm neonates admitted to NICUs are exposed to a variety of daily painful procedures as heel-prick, venipuncture and NG/OG tube insertion [(9)]. Tube feeding insertion is imperative to bypasses the preterm neonates' sucking and swallowing processes and allows nutritional substrates to be delivered to their stomach for growth and development. Although it is essential intervention, it is considered painful stimulus, and can evoke negative physiological and behavioral responses [(7)]. Ravishankar et al (2014) [(19)] found that NG tube insertion elicited pain responses in neonates. In this respect the American Academy of Pediatrics recommended the use both pharmacological and non- pharmacological interventions. Positioning such as facilitated tucking and swaddling is one of non-pharmacological methods that is designed to alleviate neonatal pain. Such positions are considered sensory stimulation measures that have securing and soothing effect on preterm neonates [(11)].

As a matter of fact, evaluation of pain during the neonatal period is difficult because neonates cannot verbalize the perceived pain. They expressed their pain through many physiological and behavioral changes[(20)]. This fact was confirmed in the current study findings where nearly half of preterm neonates in the three groups demonstrated behavioral changes during OGT insertion. Additionally, more than half of them exhibited behavioral changes immediately after OGT insertion. Conversely, a study done by Stevens et al. (2012)[(21)] showed that preterm neonates showed less behavioral and physiological responses to pain during heel stick procedure.

In fact, repeated exposure to painful procedures in early life is associated with an increased intraventricular hemorrhage, hypertension, intracranial pressure and increased demands on cardio-pulmonary system [(4)]. As illustrated in the present study findings, more than half of preterm neonates in control group had an increase in their heart rates from 5-14 beats per minutes during OGT insertion. While, the majority of those either in facilitated tucking or swaddling groups had slight increase in their heart rates from 0-4 beats per minutes. These findings could be justified by the fact that such positions improve the autonomic nervous system response and decrease hormonal markers for stress such as cortisol and epinephrine. So, improving the behavioral response of preterm neonates by producing positive changes in the motor behavior and heart rate[(22)]. Findings of Erkut and Yildiz (2017) [(23)] were not in agreement with the findings of the current study where they found that the average peak heart rates of swaddled preterm neonates were higher than those in the control group before heel lance procedure.In addition, Kucukoglu et al (2015) [(24)] found no difference between facilitated tucking group and control group in term of heart rate during vaccination.

The present study findings revealed that almost three quarters of preterm neonates in the control group had moderate decline in their oxygen saturation during OGT insertion and slight decline was observed among the majority of them immediately after this procedure. Meanwhile, no changes found in oxygen saturation among the majority of those in both studied groups whether during or immediately after OGT insertion. These findings could be attributed to the fact that both facilitated tucking and swaddling positions are considered form of sensory stimulation measures that can increase the blood flow to the body tissues and the brain; thus improving oxygen saturation [(4)]. These findings were in harmony with the findings of Reyhani et al (2014) [(25)] who reported that facilitated tucking position improves oxygen saturation of preterm neonates during venipuncture. The findings of Salimi et al (2014) [(26)] also illustrated that preterm neonates who were placed in swaddling position had higher oxygen saturation than those who did not during NGT insertion.

Currently, there is sufficient evidence that OGT insertion causes moderate pain. Preterm neonates may actually have greater sensitivity to pain than full term ones[(8)]. Eckstein (2013) [(27)]in his study about pain reaction among very preterm neonates found that preterm neonates responded more intensively to pain compared with term ones. The current study findings clarified that almost three quarters of preterm neonates in control group exhibited slight to moderate pain during OGT insertion whereas, the majority of those in both studied groups had no pain. These findings could be justified by the fact that preterm neonates have anatomic and functional requirements for pain processingthat are present as early as 20 weeks of fetal life that enable them to identify and react automatically to pain[(28)].

In addition, the findings of the present study highlighted that there was a statistical significant difference among preterm neonates of facilitated tucking group and control group. This finding could be explained in light of the fact that facilitated tucking position in addition to touch stimulates the body to release natural pain killers namely; endorphins that the body manufactures into the brain and nervous system [(29)]. These findings were in congruence with the findings of Alinejad-Naeini et al (2014) [(30)] who showed a statistical significant difference between the mean score of pain in facilitated tucking and control group during suctioning. Furthermore, Jabraeili et al (2018) [(31)] found that mean pain score reduced in facilitated tucking position during continuous positive airway pressure insertion than in the control group.

Swaddling position is another effective non-pharmacological intervention that can be applied to relieve neonatal pain. It limits the body and limbs of preterm neonates to move and respond to pain freely, which in turn reduces the number of afferent stimuli in tissues, the spinal cord, the thalamus and the cerebral cortex resulting in a decreased response in the sympathetic nervous system. So, provides relaxation and

reducing pain [21]. These facts could interpret the findings of the current study where a statistically significant difference was found among the preterm neonates of swaddling group and control group. This finding was supported by Jebreili et al (2013) [32] who found that swaddling position has positive effect on reducing the preterm neonates' pain response during NG tube insertion. Also,Dezhdar et al (2016) [28] found that mean PIPP score in swaddled neonates was significantly lower than those in the control group during venipuncture.

Although preterm neonates of both studied groups experienced less pain throughout OGT insertion than the control group, findings of the present study revealed that preterm neonates in the facilitated tucking group had slightly less pain compared to those in the swaddling group. This finding may be due to the fact explained in the gate control theory where the pressure nerves stimulated by touch during facilitated tucking position transmit their messages faster to the brain than the pain receptors, thus closing the gate and preventing the reception of the pain message [33]. Similar finding was reported by Yamada et al (2008) [34]who illustrated that swaddling position was effective in decreasing the pain response in preterm and term neonates undergoing heel lance especially when it is combined with other non-pharmacological interventions such as maternal holding and touching.

V. Conclusion And Recommendations

Conclusion:

Based on the finding of the current study, it can be concluded that facilitated tucking and swaddling were effective in reducing preterm neonates' pain during and after OGT insertion. Moreover, preterm neonates in facilitated tucking group experienced slightly less pain than those in the swaddling group.

VI. Recommendations

Based on the findings of the current study, the following recommendations are suggested:

- Nurses should use facilitated tucking and swaddling positions as non-pharmacological interventions to reduce preterm neonates' pain who are exposed to a variety of painful procedures as OGT insertion.
- Educational programs about non-pharmacological interventions should be conducted periodically for NICUs nurses to enhance their painmanagement skills.
- Non-pharmacological neonatal pain relieve interventions particularly facilitated tucking and swaddling positions should be incorporated in NICUs policies.
- The NICU Nurses should use reliable and valid pain assessment tool as PIPP scale for assessing preterm neonates' pain associating OGT insertion.

Table 1: Characteristics of the Preterm Neonates

Characteristics	**Facilitated tucking group (n=30)**		**Swaddling group (n=30)**		**Control group (n=30)**		**Test of Significance**
	No.	**%**	**No.**	**%**	**No.**	**%**	
Gestational age							
• Extremely preterm(<28 weeks)	0	0.0	2	6.7	1	3.3	
• Very preterm(28 to <32 weeks)	4	13.3	3	10.0	2	6.7	**FET**
• Late preterm (32 to <37 weeks)	26	86.7	25	83.3	27	90.0	**P = 0.835**
Mean ± SD	34.5 ± 4.55		34 ± 5.08		34.7 ± 4.51		
Gender							**X^2=0.638**
• Male.	13	43.3	14	46.7	11	36.7	**P=0.809**
• Female.	17	56.7	16	53.3	19	63.3	
Weight / grams							
• <1000	0	0.0	1	3.3	0	0.0	
• 1000 -	9	30.0	11	36.7	9	30.0	**FET**
• 2000 -	20	66.7	17	56.7	19	63.3	**P = 0.923**
• ≥3000	1	3.3	1	3.3	2	6.7	
Mean ± SD	2.5 ± 0.6		2.2 ± 0.3		2.4 ± 0.5		

X^2 = Chi Square test FET = Fisher's Exact Test *Significant at P < 0.05

Table 2: Medical History of the Preterm Neonates

Medical History	Facilitated tucking group (n=30)		Swaddling group (n=30)		Control group (n=30)		Test of Significance
	No.	%	No.	%	No.	%	
Current Diagnosis							
• Hyperbilirubinemia.	19	63.3	18	60.0	15	50.0	X^2=5.710 P=0.222
• Congenital Pneumonia.	2	6.7	6	20.0	9	30.0	
• Respiratory Distress Syndrome.	9	30.0	6	20.0	6	20.0	
Type of Delivery							
• Normal Vaginal Delivery.	7	23.3	9	30.0	10	33.3	X^2=0.757 P=0.685
• Cesarean Section.	23	76.7	21	70.0	20	66.7	

X^2 = Chi Square test *Significant at P < 0.05

Table 3: Effect of Facilitated Tucking and Swaddling Positions on Preterm Neonates' Behavioral State before, during and ImmediatelyafterOrogastricTube Insertion

Behavioral State	Before Orogastric Tube Insertion			During Orogastric Tube Insertion			Immediately After Orogastric Tube Insertion		
	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)
	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %
▪ Active/awake eyes open facial movements.	2 6.7	1 3.3	1 3.3	1 3.3	2 6.7	1 3.3	1 3.3	2 6.7	1 3.3
▪ Quiet/awake eyes open no facial movements.	4 13.3	5 16.7	5 16.7	9 30.0	9 30.0	10 33.3	6 20.0	6 20.0	8 26.7
▪ Active /sleep eyes closed facial movements.	19 63.3	18 60.0	19 63.3	14 46.7	13 43.3	14 46.7	17 5.67	16 53.3	16 53.3
▪ Quite /sleep eyes closed no facial movements.	5 16.7	6 20.0	5 16.7	6 20.0	6 20.0	5 16.7	6 20.0	6 20.0	5 16.7
Test of Significance (FET)	P1= 0.100	P2= 0.100	P3= 0.100	P1= 0.100	P2= 0.100	P3= 0.100	P1= 0.100	P2= 0.100	P3= 0.100

FET: Fisher's Exact Test *Significant at P < 0.05 P_1: Comparison between facilitated tucking group and swaddling group

P_2: Comparison between facilitated tucking group and control group P_3: Comparison between swaddlinggroup and control group

Table 4: Effect of Facilitated Tucking and Swaddling Positions on Preterm Neonates' Heart Ratesbefore, during and ImmediatelyafterOrogastricTube Insertion

Increase in HeartRates	Before Orogastric Tube Insertion			During Orogastric Tube Insertion			Immediately After Orogastric Tube Insertion		
	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)
	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %
▪ From 0-4 beats per minute.	30 100.0	30 100.0	30 100.0	26 86.7	25 83.3	6 20.0	30 100.0	29 96.7	26 86.7
▪ From 5-14 beats per minute.	0 0.0	0 0.0	0 0.0	4 13.3	5 16.7	17 56.7	0 0.0	1 3.3	4 13.3
▪ From 15-24 beats per minute.	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	7 23.3	0 0.0	0 0.0	0 0.0
▪ From 25 beats per minute and more.	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Test of Significance (FET)	-	-	-	P1= 0.100	**P2: = 0.000***	**P3: = 0.000***	P1= 0.100	P2= 0.052	P3= 0.097

FET: Fisher's Exact Test *Significant at $P < 0.05$ P_1: Comparison between facilitated tucking group and swaddling group
P_2: Comparison between facilitated tucking group and control group P_3: Comparison between swaddlinggroup and control group

Table 5: Effect of Facilitated Tucking and Swaddling Positions on Preterm Neonates' Oxygen Saturationbefore, during and ImmediatelyafterOrogastricTube Insertion

Decrease in Oxygen Saturation	Before Orogastric Tube Insertion			During Orogastric Tube Insertion			Immediately After Orogastric Tube Insertion		
	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)
	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %
No desaturation "from 0 to 2.4% decrease.	30 100.0	30 100.0	30 100.0	28 93.3	26 86.7	3 10.0	30 100.0	27 90.0	4 13.3
Slight desaturation "from 2.5 to 4.9% decrease	0 0.0	0 0.0	0 0.0	2 6.7	4 13.3	5 16.7	0 0.0	3 10.0	26 86.7
Moderate desaturation "from 5 to 7.4% decrease	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	22 73.3	0 0.0	0 0.0	0 0.0
Severe desaturation "from 7.5% decrease and more.	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Test of Significance (FET)	-	-	-	P1= 0.100	**P2: = 0.000***	**P3: = 0.000***	P1= 0.100	**P2: = 0.000***	**P3: = 0.000***

FET: Fisher's Exact Test *Significant at $P < 0.05$ P_1: Comparison between facilitated tucking group and swaddling group
P_2: Comparison between facilitated tucking group and control group P_3: Comparisonbetween swaddlinggroup and control group

Table 6: The Total Percent Score of Pain Perceived by Preterm Neonates in the Facilitated Tucking Group, the Swaddling Group and the Control Group

P 2: Comparison between facilitated tucking group and control group P 3: Comparison between swaddlinggroup and control group

Total Percent Score of Pain	Before Orogastric Tube Insertion			During Orogastric Tube Insertion			Immediately After Orogastric Tube Insertion		
	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)	Facilitated Tucking Group (n=30)	Swaddling Group (n=30)	Control Group (n=30)
	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %	NO. %
No pain **(0 - 6).**	30 100.0	30 100.0	30 100.0	27 90.0	25 83.3	6 20.0	30 100.0	29 96.7	26 86.7
Slight to moderate pain **(7-12).**	0 0.0	0 0.0	0 0.0	3 10.0	5 16.7	22 73.3	0 0.0	1 3.3	4 13.3
Severe pain **(>12).**	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 6.7	0 0.0	0 0.0	0 0.0
Mean ± S.D	3± 1.10	4± 3.45	4± 2.33	3± 2.13	4± 2.65	8± 2.13	3± 4.13	4± 1.77	5 ± 3.12
Test of Significance (FET)	-	-	-	P1= 0.100	**P2: = 0.000***	**P3: = 0.000***	P1= 0.100	P2: = 0.112	P3: = 0.177

FET: Fisher's Exact Test *Significant at P < 0.05 P_1: Comparison between facilitated tucking group and swaddling group
P_2: Comparison between facilitated tucking group and control group P_3: Comparison between swaddling group and control group

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