Effect of Yakson Touch and Oral Glucose on Pain Intensity among Preterm Neonates during Heel Lancing

Mohamed Farouk Omar[1] Eman Sayed Masoad[2]; Salah Mahmoud Saleh [3]; Amna Nagaty Aboelmagd [4]

1. M.Sc. N, Faculty of Nursing, Minia University.
2. Professor of Pediatric Nursing, Faculty of Nursing, Minia University.
3. Professor of Pediatrics, Faculty of Medicine, Minia University.
4. Assistant Professor of Pediatric Nursing, Faculty of Nursing, Minia University.

Abstract

Background: Preterm infants spend the early days of their lives in neonatal intensive care units, where they undergo many essential painful procedures. Due to the harmful effects of pain on neonates, non-pharmacological methods aid in pain-controlling high-risk neonates. **Aim of the study:** The aim of the current study is to evaluate the effect of Yakson touch and oral glucose on pain intensity among preterm neonates during heel lancing. **Research design:** A quasi-experimental research design was utilized to achieve the aim of this study**. Sample:** A purposive sample of 120 preterm neonates divided equally (40 preterm neonates) into three groups (Yakson touch, oral glucose, and control groups). **Tools:** Three tools were used to test research hypotheses. **Tool I:** A structured interviewing questionnaire that includes **part I**: Bio-demographic characteristics of preterm neonates'; **part II:** Baseline vital signs and oxygen saturation parameters. **Tool II:** Neonatal infant pain scale and **Tool III:** Premature infant pain profile **Result:** The mean gestational age for Yakson respectively, case and control groups were 34.5±1.4, 33.7±1.6, 34.1±1.8 weeks respectively, more than half of studied preterm neonates were admitted to neonatal intensive care unit with respiratory distress with no statistically significant difference among three groups. Markedly decreased total mean scores of neonatal infant pain scale and premature infant pain profile in Yakson touch and oral glucose groups than in the control group during heel lancing. **Conclusion:** Yakson touch and oral glucose 25% is effective in pain reduction of preterm neonates during heel lancing. **Recommendation:** Provide booklets and compact discs about the Yakson touch technique and oral glucose to help its applicability by neonatal nurses.

Keywords: Heel lancing, oral glucose, Pain intensity, Preterm neonates, Yakson touch

Introduction

Premature birth is a significant worldwide health issue, with over fifteen million preterm infants being born each year and around one million dying due to problems related to prematurity. Prematurity, defined as birth occurring prior to 37 weeks of gestation, necessitates specialized care for preterm newborns, leading to their admission to neonatal intensive care units (NICU) in varying quantities **(Lopes et al., 2024)**.

Pain is an unpleasant psychological and sensory experience accompanied by tissue damage. The American Pain Society has considered pain the fifth vital sign that should be controlled daily. Pain can be acute, established, or chronic. It can further be classified as physiologic, inflammatory, neuropathic, or visceral, with each of these categories further divided according to the degree of severity **(Cravero et al., 2019)**.

Healthcare personnel often hold the assumption that preterm infants do not perceive or undergo pain. However, evidence suggests that these neonates not only experience pain but also react more strongly to it than newborns who are delivered at term **(Zhao et al., 2022).**

Preterm infants may exhibit physiological responses to painful operations, including rapid shallow breathing, elevated heart rate, and increased blood pressure, decreased arterial oxygen saturation, pallor, and increased muscular tone. Physiological responses, although not exclusive to pain, should be combined with other behavioral and contextual reactions when assessing procedural pain. Behavioral reactions encompass facial expression, vocalization, and motor activity, while contextual responses involve sleep-wake states **(Magor et al., 2024)**.

The objectives of managing pain in preterm infants are to reduce the intensity and the behavioral and physiological effects of pain, enhance the preterm infants' capacity to handle painful events and administer interventions that yield optimal benefits with minimal risk **(Carachi & Williams, 2020).**

Yakson touch is one of the non-pharmacologic techniques with the means 'healing hand.' Using one hand to softly massage the baby's stomach and the other to place on their back, this ancient Korean therapeutic touching method helps calm and ease discomfort in newborns and infants. They believe that preterm infants absorb warmth and energy through the provider's palm, which is believed to reduce the infant's tension **(Osman et al., 2024).**

Oral glucose solutions are thought to provide analgesia using a number of different methods, one of which includes the increased production and release of endorphins due to the intake of a sweet solution. A recent meta-analysis revealed that glucose is an acceptable alternative to sucrose, which decreases premature neonates' pain scores and crying times associated with venipuncture and heel lance **(Mehmood et al., 2023; Ahmed, 2020)**

Neonatal nurses are crucially involved in providing care for premature newborns experiencing pain. Nurses assume responsibility for evaluating and addressing pain, overseeing the treatment of pain, advocating for newborns and parents, and providing education to parents. By synthesizing the experiences and perspectives of nurses who care for infants in pain, we can gain valuable insights that can be used

to enhance the assessment and management of pain for this vulnerable population. Nurses in the NICU should acquaint themselves with the latest research on neonatal care and be prepared to provide developmental care **(Magor et al. 2024; Zhao et al. 2022).**

Significance of the study

Prematurity is the leading factor contributing to infant mortality worldwide. In Egypt, preterm delivery complications accounted for the majority of baby deaths in 2018, with a rate of 38%. Preterm neonates experiencing pain may result in enduring alterations in brain processing and the development of maladaptive behavior in the future. Pain can negatively impact the preterm infant's capacity to acquire and retain new information. The hospitalized preterm neonates experience invasive, unpleasant treatments at a rate ninety-three times higher than others. Moreover, a significant number of premature newborns undergo these surgeries without the administration of any analgesic medications or behavioral pain control techniques **(Farag et al. 2022; Shiff et al. 2021)**

Experts and national guidelines both recommend frequently assessing neonates for pain and using both pharmacologic and nonpharmacologic pain management strategies to lessen pain in order to prevent negative outcomes in infants, especially preterm infants. Nonpharmacologic therapies are crucial due to their reliance on clinical pain evaluations conducted by nurses and their feasibility for implementation by nursing staff. **(Tekgündüz, et al. 2019)**

This study aims to provide a basis for the management of expected procedural pain by quantifying and grading pain experience of commonly performed painful procedures according to pain assessment scales so that medical staff could adopt early interventions (Yakson touch and oral glucose 25 %) conveniently and precisely when performing specific necessary procedures on newborns.

Aim of the Study:

The present study aimed to evaluate the effect of Yakson touch and oral glucose on pain intensity among preterm neonates during heel lancing.

Research hypotheses:

The current study results tested the following research hypotheses.

H_0: There will not be significant differences between Yakson touch, oral glucose, and control groups on pain intensity among preterm neonates during heel lancing.

H_1: Preterm neonates in the Yakson touch group and oral glucose group will have a lower pain intensity score than the control group during heel lancing.

Operational definition

Pain Intensity During Heel Lancing: Determine preterm neonates' pain score by NIPS and PIPP from the beginning of heel lancing and up to one minute after heel lancing.

Research Design:

A Quasi-experimental research design (study and control groups) was used to achieve the aim of the current study.

Setting:

The present study was conducted in the Neonatal Intensive Care Unit (NICU) at Minia University Hospital for Obstetric and Pediatrics (MUHOP)

Sample:

A Purposive sample was used to conduct the current study according to the following criteria. The preterm neonates of gestational age between 34- < 37 weeks, lack of receiving sedatives or tranquilizers 24 hours before and up to the end of the intervention. The preterm neonates whose caregivers are willing to participate in the study. The preterm neonates excluded from the current study who have congenital malformation, Intracranial hemorrhage or neurological disorder, Premature neonates on mechanical ventilation, Painful procedures immediately before intervention study, and Premature neonates that had hyperthermia.

Sample Size: 120 preterm neonates were included to conduct the study based on the following equation **(Belpınar and Yayan, 2023)**

$$N = \frac{\frac{t^2 \times p(1-p)}{m^2}}{\frac{(1.96)^2 \times 0.19(1-0.19)}{0.05^2}}$$

N = 120

Description:

t = confidence level at 95 % (standard value of 1.960)

p = estimated prevalence of preterm neonates at obstetric and pediatric Minia University Hospital 2020 (0.19)

m = margin of error at 5 % (standard value of 0.050)

The subjects were divided equally into three groups.

The first group: **Yakson touch group,** 40 preterm neonates

The second group, the **oral glucose group,** 40 preterm neonates

The third group: **control group,** 40 preterm neonates

Data Collection Tools

Three tools were used to collect the data.

Tool I: Bio-demographic characteristics of preterm neonates: It was developed by the researchers and involved 12 items, which included two parts:

Part one: gestational age, gender, birth weight, current weight, age at the time of study, mode of delivery, and medical diagnosis of preterm

Part two: Vital signs and oxygen saturation assessment sheet, which included heart rate, respiratory rate, body temperature, and oxygen saturation.

Tool II: Neonatal Infant Pain Scale (NIPS):

Neonatal infant pain scale (NIPS) was developed by **Lawrence et al. (1993)** and it is appropriate for neonates aged from 28-40 weeks of gestational age. A visual analog pain scale was used to assess the behavioral responses before and during each intrusive procedure. It includes six items: facial expressions, arms, cry, legs, breathing patterns, and state of arousal.

Scoring system:

Neonatal Infant Pain Scale was scored from zero to one for facial expression, arm, leg, breathing pattern, and state of arousal items, respectively, while was scored from zero to two for cry items with a maximum of score seven. Total pain

sore from zero to two was referred to no pain, from three to four was indicated to moderate pain, while more than four was referred to severe pain.

Tool III: Premature Infant Pain Profile (PIPP):

The premature infant pain profile was developed by **Stevens et al. (1996)** and consists of seven items, including gestational age, eye squeeze, behavioral state, nasolabial furrow, heart rate, oxygen saturation, and brow bulge heart rate, oxygen saturation, and brow bulge.

Scoring system:

Premature Infant Pain Profile was scored from one to three for gestational age, eye squeeze, behavioral state, nasolabial furrow, heart rate, oxygen saturation, and brow bulge items (total pain score 21). Total pain scores from zero to six indicated no or minimal pain, from seven to twelve indicated moderate pain, while a score of more than twelve indicated severe pain.

Validity and reliability

Data collection tools were developed after an extensive review of the literature. The tools were reviewed by five-panel experts in neonatology and Pediatric Nursing to test the content validity of the tools (three professors of pediatric nursing from Cairo University, faculty of nursing, and two assistant professors of pediatric nursing from the faculty of nursing, Minia University). Reliability of the NIPS PIPP was performed to confirm its consistency by Cronbach alpha test 0.95 and 0.92, respectively.

Ethical considerations

A written initial primary approval was obtained from the research ethics committee of the Faculty of Nursing, Minia University. Written informed consent was obtained from the mothers of neonates after a complete description of the purpose and nature of the study to obtain their acceptance and gain their cooperation. Mothers were informed that participation in the current study is voluntary and have the right to withdraw from the study without giving any reason and without any effect on the care of their preterm neonates. Confidentiality was assured to each preterm neonate and their mothers.

Pilot study

A pilot study was conducted on twelve preterm neonates (10%) to test the study data collection tools in terms of their clarity, applicability, and time required to fulfill it. According to its result, modifications in demographic data were done (current weight of preterm neonates, age at the time of study) and pilot study cases were excluded from total cases.

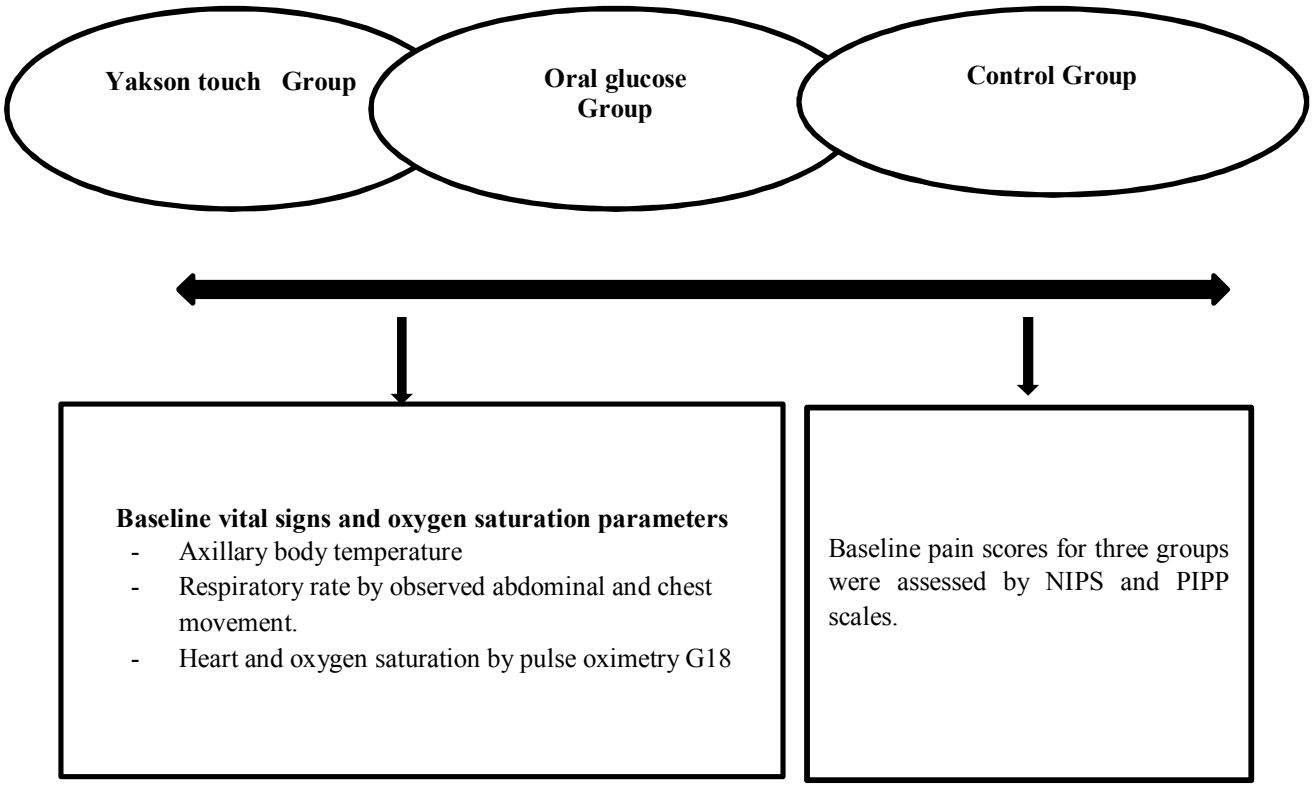
Data Collection Procedures

The researchers begin the data collection procedure as the following sequences.

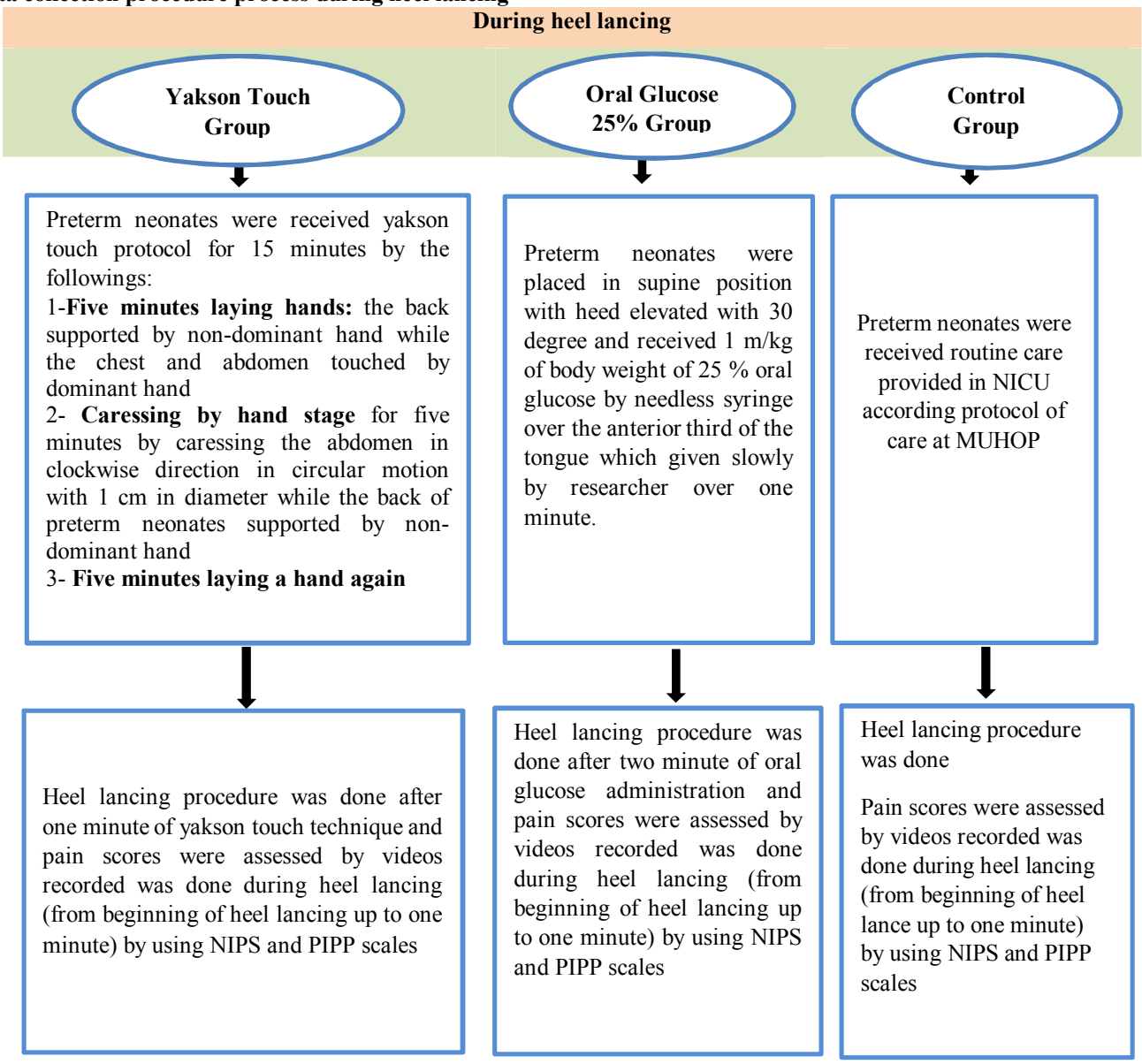
Before the intervention procedure:

An interview was conducted with the mothers of the preterm neonates who were accompanied at the time of the procedure to explain the aim of the study and obtain permission to include their preterm neonates in the current study. The researchers explained a clear and simple explanation of the aim and the content of the sheet to mothers, reassuring them that the procedure was safe, and invited them to participate and written informed consent was obtained from mothers. After gaining approval from the mother, the researchers explained the assessment pain scale that is used to assess pain for preterm neonates.

I: **Data collection procedure process before heel lancing**



II: Data collection procedure process during heel lancing



Statistical analysis

The data that was gathered was organized in tables analyzed, and computerized using SPSS (statistical package for the social science version 28). Descriptive and inferential statistics were utilized to present the study data. The data is expressed descriptively through the use of numbers and percentages. Quantitative data were presented by mean and standard deviation. Quantitative continuous data were compared using F-test in case of comparison among three groups. The chi-square and Fisher exact tests were used to test the association between two qualitative variables or to detect differences between two groups. The level of significance was accepted at a p-value < 0.05.

Result

Table (1): Mean scores of gestational ages, age at study, birth weight, and current weight of the studied preterm neonates among yakson touch, oral glucose 25%, and control groups (n =120)

Characteristics of preterm	Groups						Test	P-value
	Yakson Touch (n=40)		Oral glucose 25% (n=40)		Control (n=40)			
	No	%	No	%	No	%		
Gestational age of preterm per weeks								
Mean ± SD	34.5±1.4		33.7±1.6		34.1±1.8		F=2.239	0.099 NS
Mini-Maxi	32- 36		31-36		31-36			
Age at the study per day								
Mean ± SD	5.42±2.6		5.42±3.07		4.37±2.61		F=1.905	0.153 NS
Mini-Maxi	1-10		1-10		1-10			
Birth weight in gram								
Mean ± SD	2194 ± 496.4		11984.5±351.6		2010.7±668.1		F=2.262	0.109 NS
Mini-Maxi	1340-3000		1400-3180		1320-3050			
Current weight of preterm at study per gram								

Characteristics of preterm	Groups						Test	P-value
	Yakson Touch (n=40)		Oral glucose 25% (n=40)		Control (n=40)			
	No	%	No	%	No	%		
Mean ± SD	2156.6±515.9		1960.2±381.7		1970±604.8		F=2.164	0.102 NS
Mini-Maxi	1340-2940		1400-3140		1320-2970			

NS=no significant difference

Table (1) shows that the mean gestational age of studied preterm neonates was 34.5±1.4, 33.7±1.6, and 34.1±1.8 weeks, respectively, and the mean age of the studied preterm neonates at the time of study were 5.42±2.6, 5.42±3.07, and 4.37±2.61 days, respectively. Additionally, table one proves that the mean birth weight of the studied preterm neonates was 2194±496.4, 1984.5±351.6, and 2010.7±668.1 gram, respectively. On the other hand, the mean current weight at the time of the study among the three groups was 2156.6±515.9, 1960.2±381.7, and 1970±604.8 grams, respectively. Finally, there was no statistically significant difference among the three groups regarding all bio-demographic characteristics of preterm neonates, respectively

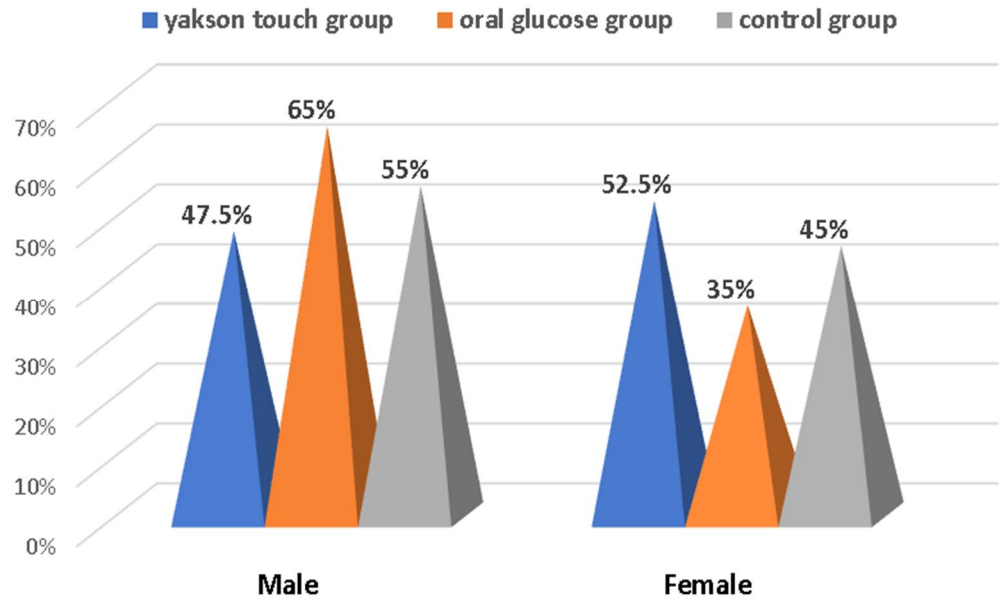


Figure 1: Gender distribution of studied preterm neonates among yakson touch, oral glucose 25%, and control groups (n = 120)

Figure 1 illustrates that 47.5%, 65%, and 55% of yakson touch, oral glucose, and control groups were male, respectively, with no statistically significant difference

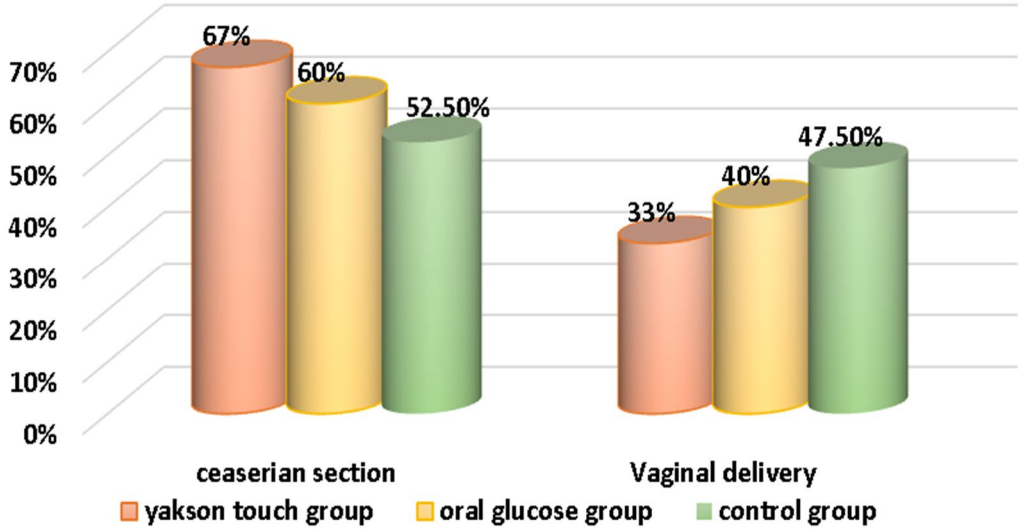


Figure 2: Mode of delivery of studied preterm neonates among yakson touch, oral glucose 25%, and control groups (n =120)

Figure 2 highlights that 67%, 60%, and 52.5% of the studied preterm neonates were delivered by the caesarian section, respectively, with no statistically significant difference among the three groups

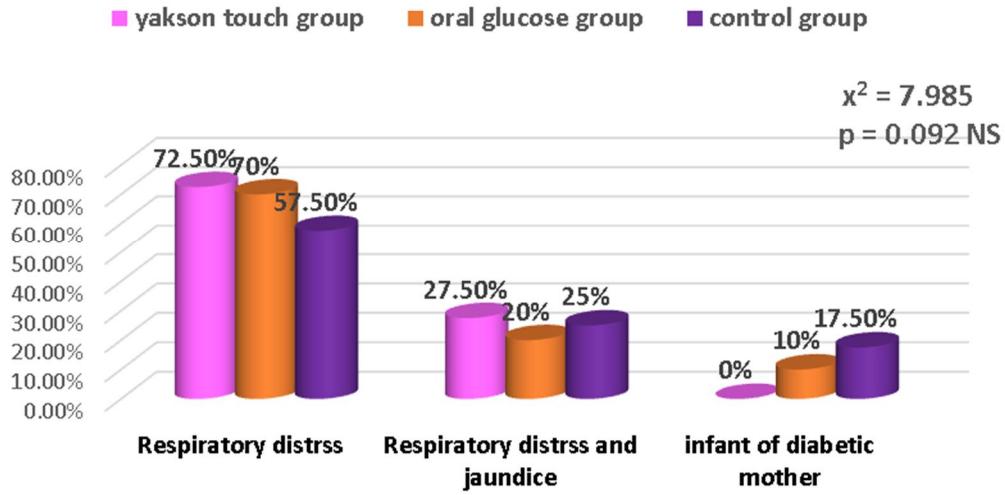


Figure 3: Medical diagnosis of studied preterm neonates among yakson touch, oral glucose 25%, and control groups (n =120).

Figure 3 justifies that 72.5%, 70%, and 57.5% of the three groups were admitted to the neonatal intensive care unit with respiratory syndrome, respectively, with no statistically significant difference among the three groups.

Table (2): Baseline mean vital signs and oxygen saturation parameters of the studied preterm neonates among yakson touch, oral glucose 25%, and control groups before heel lancing (n =120)

Vital signs and oxygen saturation	Groups			F	P-value
	Yakson Touch (n=40)	Oral glucose 25% (n=40)	Control (n=40)		
Heart rate					
Mean ±SD	147 ± 13.5	153 ± 16.2	150 ± 23.6	F=1.366	0.259 NS
Respiratory rate					
Mean ±SD	53 ± 7.5	56 ± 8.5	55 ± 9.4	F=1.565	0.213 NS
Body temperature					
Mean ±SD	36.9± 0.19	37.0± 0.23	37.0 ± 0. 20	F=2.015	0.817 NS
Oxygen saturation					
Mean ±SD	97 ± 0.75	97 ± 0.8	97 ± 0.78	F=2.125	0.601 NS

NS: No significant difference

Table (3) Indicates that the heart rate mean among yakson touch, oral glucose 25%, and control groups was 147 ± 13.5, 153 ± 16.2, and 150 ± 23.6 beats/minutes, respectively, and the mean of respiratory rate was 53 ± 7.5, 56 ± 8.5, 55 ± 9.4 breath/minute, respectively. Additionally, the mean degree of the body temperature of studied preterm neonates among yakson touch, oral glucose 25%, and control groups was 36.9± 0.19, 37.0± 0.23, 37.0 ± 0.20 °C, respectively, and the mean oxygen saturation was 97 ± 0.75, 97 ± 0.8, 97 ± 0.78, respectively. Lastly, table 3 declares that there is no statistically significant difference regarding all vital sign parameters at a baseline among the three groups before heel lancing

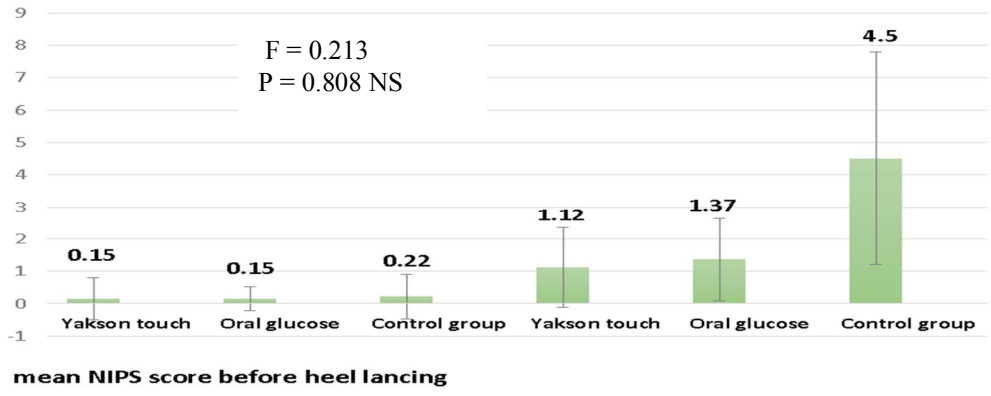


Figure 4: Mean of the neonatal infant pain scale of the studied preterm neonates among yakson touch, oral glucose 25%, and control groups before and during heel lancing (n =120)

Figure 4 noted that there was no statistically significant difference among the three groups regarding the total mean score of NIPS before heel lancing. On the other hand, the total mean of neonatal infant pain scale declined in the yakson touch and oral glucose 25% groups than in the control group during heel lancing (1.12±1.24, 1.37±1.27, 4.5±1.27 respectively), with highly statistically significant difference *(p = 0.0001)*

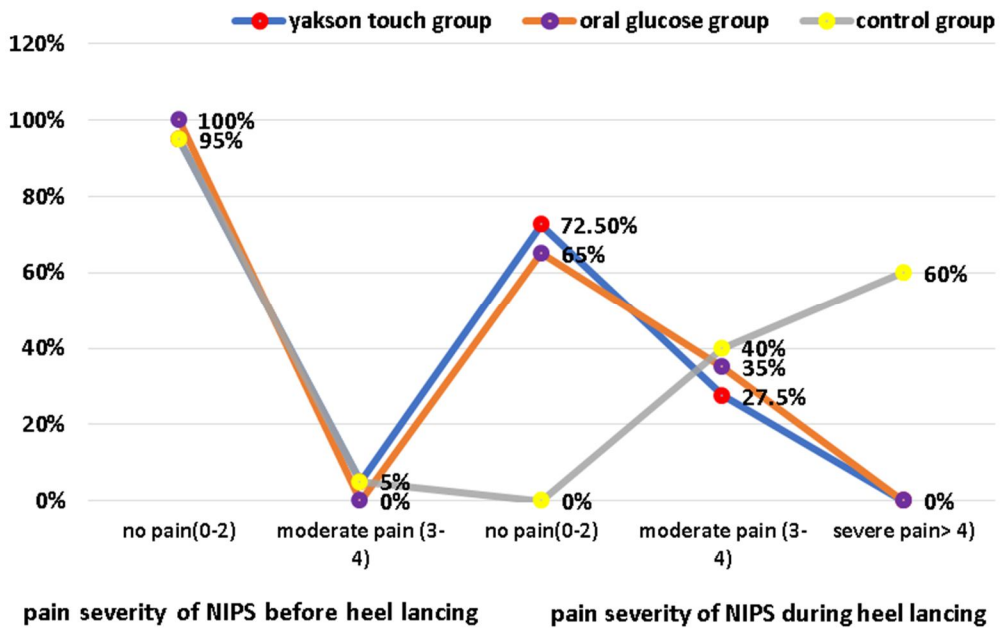


Figure 5: Pain severity level of neonatal infant pain scale in the studied preterm neonates among yakson touch, oral glucose 25%, and control groups before and during heel lancing (n =120)

Figure 5 highlights that 95%, 100%, and 95% of the studied preterm neonates among the three groups show no pain before heel lancing with no statistically significant difference. On the other hand, 72.5%, 65% of the studied preterm neonates among yakson touch and oral glucose 25% groups reacted with no pain during heel lancing, while 60% of the control group presented with severe pain during heel lancing regarding neonatal infant pain scale severity with highly statistically significant difference (*P* = 0.0001)

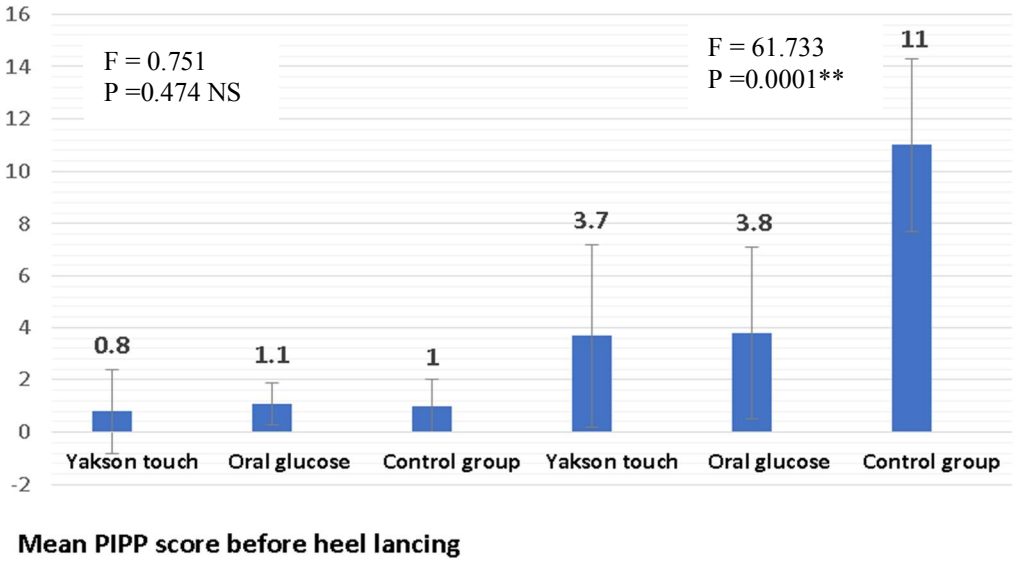


Figure 6: total mean scores of premature infant pain profile in the studied preterm neonates among yakson touch, oral glucose 25%, and control groups before and during heel lancing

Figure 6 illustrates that there was no statistically significant difference in the three groups regarding the total mean score of PIPP before heel lancing, respectively. On the other hand, the total mean score of PIPP was decreased in yakson touch and oral glucose 25% groups than in control groups during heel lancing with a highly statistically significant difference *(P =0.0001)*

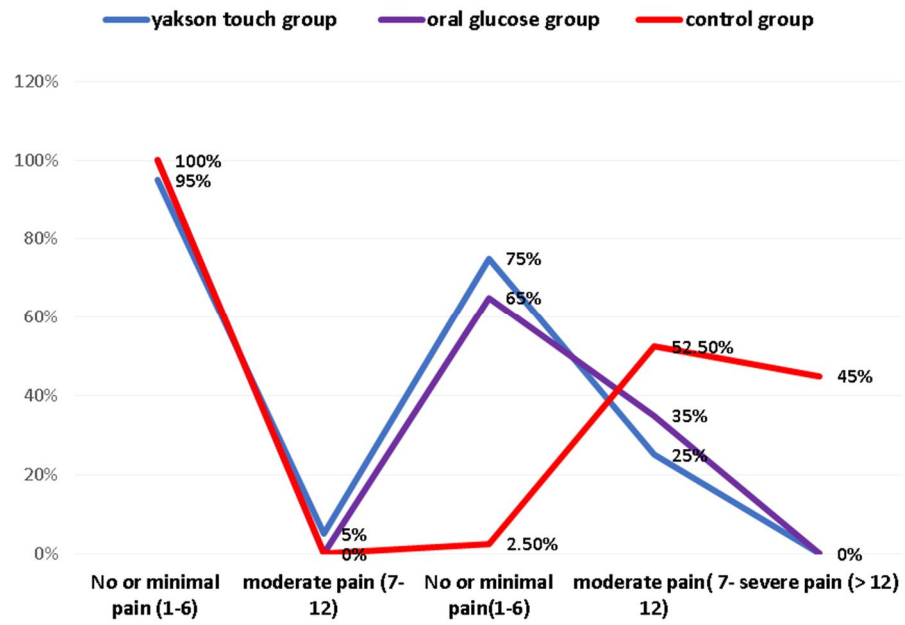


Figure 7: Pain severity level of premature infant pain profile of the studied preterm neonates among yakson touch, oral glucose 25%, and control groups before and during heel lancing (n =120)

Figure 7 highlights that 95%, 100%, and 100% of studied preterm neonates among the three groups appeared with no pain before heel lancing regarding pain severity of premature infant pain profile, respectively, with no statistically significant difference (*P* =0.131). On the other hand, 75 % and 65% of the studied preterm neonates among yakson touch and oral glucose 25% groups appeared with no pain during heel lancing, while 52.5% of the control group have moderate pain, and 45% of them have severe pain regarding the severity of premature infant pain profile with highly statistically significant difference (X^2 = 66.133, *p = 0.000*)

Discussion:

Concerning bio-demographic characteristics of studied preterm neonates, the current study proved that there was no statistical significance difference among the studied preterm neonates among yakson touch, oral glucose 25%, and control groups. This finding is in accordance with **Rashed et al. (2023)**, who assessed the "Effect of Yakson Touch Technique on Selected Health Outcomes among Preterm Neonates in the Neonatal Intensive Care Units", which documented that there was no statistical significance difference between the study and control group related demographic characteristics. According to the researchers' point of view, this finding is due to the homogenous characteristics of the studied preterm neonates.

As regards to vital signs baseline for yakson touch, oral glucose 25%, and control groups, the present study indicated that heart rate mean were 146.6±13.5, 153.4±16.2, and 149.8±23.6 beat/m, respectively. On the context **Farag et al. (2022)**, who assessed the "Effect of Yakson's Therapeutic Touch on Vital Signs, Growth Measurements, and Behavioral State of Preterm Neonates", they documented that the mean heart rate between Yakson touch and the control group before intervention were 144.18 ± 4.889, and 149.76 ± 3.956 respectively.

In addition, the present study highlighted that the mean respiratory rate baseline for yakson touch, oral glucose 25%, and control groups were 52.8±7.5, 56.0±8.5, and 55.5±9.4, respectively. The result contradicts with **Vadakkan and Prabakaran (2022)**, who Compared the "Effect of Nesting and Swaddling on Sleep Duration and Arousal Frequency among Preterm Neonates: A Randomized Clinical Trial." they founded that the mean respiratory rate in the nesting group and swaddling group were 39 ± 4.90 and 38.25 ± 4.87 respectively.

Regarding the oxygen saturation baseline parameter before the intervention, the current study found that the mean oxygen saturation among yakson touch, oral glucose 25%, and control groups were 97.3± 0.75, 97.28± 0.8, and 97.26± 0.78, respectively. The result is in accordance with **Sasidharan et al. (2022),** who evaluated the "Effect of 25% Dextrose Versus 24% Sucrose for Heel Lancing in Preterm Infants: A Noninferiority randomized control trial". They explained that the mean oxygen saturation characteristics for 25 % dextrose and 24% sucrose groups were 96 ± 2 for both groups respectively.

The current study highlighted no statistically significant difference among studied preterm neonates considering baseline parameters of vital signs. The same was discussed by **Mir et al. (2018)** during assessed " Effects of Yakson Therapeutic Touch and Heel Warming on Pain Caused by Heel Stick Procedure, Vital Signs, and Cry Duration in Full-term Neonates". They explained that there was no statistically significant difference between the study group and control group regarding the respiratory rate and heart rate mean before the heel stick.

Similarly reported in a randomized clinical trial published by **Lima et al. (2017)**, who assessed "Glucose solution is more effective in relieving pain in neonates than non-nutritive sucking." They proved that there was no statistically significant difference among the studied groups regarding baseline heart rate and oxygen saturation. Regarding researchers' opinion, these findings related to homogeneity of groups and stability of preterm neonates before painful procedures.

The current study documented no statistically significant difference among yakson touch, oral glucose 25%, and control groups regarding the total mean pain score of NIPS before heel lancing. On the other hand, the total mean

pain score of NIPS markedly declined in Yakson touch and oral glucose than in the control group during heel lancing, and **This finding rejects the null hypothesis**. In context, a randomized control trial explored by **Belpınar and Yayan (2023)** to examine the "Effect of Yakson touch and mother's voice on pain and comfort level during nasal continuous positive airway pressure application in Turkey." They found that there was no statistically significant difference between the yakson touch and control group regarding the total pain mean score of NIPS before the intervention, while the total mean pain score of NIPS among the Yakson group declined than in control group during and after application of nasal continuous positive airway pressure.

The similarity was found in a randomized control trial published by **Tekgündüz et al. (2019),** who studied the "Effect of Oral Glucose and Listening to Lullaby to Decrease Pain in Preterm Infants Supported with NCPAP." They confirmed that there was no statistically significant difference between oral glucose and control groups before the intervention, while it was obvious that the total mean pain score of NIPS was decreased in the oral glucose group than control group during and after the intervention of continuous positive airway pressure.

On the context, **Dehghani et al. (2019)** during their comparison study that assessed " the Effect of Yakson Touch and Oral Glucose on the Severity of Phlebotomy Pain in Preterm Infants." They highlighted that there were no statistically significant differences among yakson touch, oral glucose, and control groups based on the total mean score of NIPS before intervention.They also documented that the total mean pain score of NIPS in yakson touch and oral glucose decreased than in the control group after phlebotomy.

Considering pain severity level related to NIPS, the present study noted that more than two-thirds of the yakson touch group and more than three-fifths of the oral glucose 25% groups experienced no pain during heel lancing while more than half of the control group reacted by severe pain during heel lance. Additionally, a randomized controlled study was explored by **Belpınar andYayan (2023)**, who examined the "Effect of Yakson touch and mother's voice on pain and comfort level during nasal CPAP application in Turkey." They determined that there was no statistically significant difference between the study and control group before intervention. On the other hand,they explained that preterm neonates in control groups experienced more severe pain than study groups. The researchers refer to the fact that applying these two non-pharmacological methods can significantly establish a stable environment for premature neonates. The adaptation of premature neonates to stable environments presents a valuable strategy for mitigating pain.

The current study confirmed there was no statistically significant difference among studied preterm neonates with a total mean of PIPP score before heel lancing. On the other hand, the total mean score of PIPP was obviously decreased in the yakson touch and oral glucose 25% groups than in the control group during heel lancing, **and this result rejects the null hypothesis**. In the context a randomized controlled trial conducted by **Parhi et al. (2021)**, who examined the "Efficacy of Yakson touch and kinesthetic stimulation on the behavioral development, pain, and vitals of pre-term neonates during critical care stay." They documented that the mean score of PIPP was markedly lower in the study groups than in the control group.

Additionally, **Qiu et al. (2017)** estimated the "Effect of combined music and touch intervention on pain response and β-endorphin and cortisol concentrations in late preterm infants." They judged that there was no significant change between the control and experimental group regarding the total PIPP mean score at the beginning of hospitalization, and within times there was a markedly decreased PIPP score in the experimental group than control group. The researchers justify this finding due to the soothing effect of Yakson touch, which transferred energy from the researchers' hands to neonates to maintain stability and decrease the behavioral pain reaction of preterm neonates.

Considering the severity level of PIPP, the current study indicated that more than two-thirds of the yakson touch and approximately two-thirds of the oral glucose 25 % groups have no pain during heel lance. This result is supported by **Magor et al. (2024)**, who studied "Effectiveness of nesting positioning and Yakson touch on physiological, behavioral state and pain caused by blood sampling procedures in preterm neonates. They noted that minorities of the study group experienced severe pain during the blood sample procedure and more than two-fifths of the control group presented with severe pain during the blood sample.

On the other hand, **Sudha and Bibiana (2020)** assessed the "effectiveness of oral administration of dextrose in relieving pain during heel stick among preterm neonates." They stated that more than two-thirds of the experimental group had no pain of PIPP during heel stick.

Similarly, **Kheir et al. (2017)** assessed 'the analgesic effect of oral glucose and breastfeeding during procedural pain in neonates.' They confirmed that more than two-thirds of the oral glucose group presented with no pain during procedural pain. The researchers explained this finding due to yakson touch being able to increase the sleep scores of neonates, affect their behavioral response, and decrease their stress levels. On the other hand, the researchers applied oral glucose on the anterior third of the tongue, where sweet sensation receptors are located, and oral glucose mediated by endogenous endorphin dispersal, which contributes to the modulation of the pain pulse at the level of the spinal cord.

Conclusion

The current study concluded that a homogeneity of bio-demographic characteristics of preterm neonates, with no statistically significant difference regarding vital signs' parameters among the three groups. Yakson touch and oral glucose 25% are effective in reducing pain intensity during heel lancing.

Recommendations:

The current study recommended that:

- Construct guidelines and strategies about pharmacological and non-pharmacological pain management in preterm neonates should be clearly provided in the neonatal intensive care unit to protect high-risk neonates from hazards of pain.
- Conduct further study to ensure the safety and applicability of Yakson touch and oral glucose in NICU.
- Collaborate with preterm neonates' mothers and provide them with essential training regarding non-pharmacological pain management.

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