International Journal of Research In Paediatric Nursing

E-ISSN: 2664-1305
P-ISSN: 2664-1291
www.paediatricnursing.net
IJRPN 2024; 6(2): 52-60
Received: 19-06-2024
Accepted: 24-07-2024

Mohamed Farouk Omar
M.Sc., Faculty of Nursing, Minia University, Egypt

Eman Sayed Masoad
Professor of Pediatric Nursing, Faculty of Nursing, Minia University, Egypt

Salah Mahmoud Saleh
Professor of Pediatrics, Faculty of Medicine, Minia University, Egypt

Salah Mahmoud Saleh
Assistant Professor of Pediatric Nursing, Faculty of Nursing, Minia University, Egypt

Corresponding Author:
Mohamed Farouk Omar
M.Sc., Faculty of Nursing, Minia University, Egypt

Effect of oral glucose administration on pain intensity among preterm neonates during heel lancing

Mohamed Farouk Omar, Eman Sayed Masoad, Salah Mahmoud Saleh and Amna Nagaty Aboelmagd

DOI: https://doi.org/10.33545/26641291.2024.v6.i2a.174

Abstract
Background: Preterm birth is a global epidemic that is the second leading cause of death for children under five years. Experiencing painful procedures is an inevitable part of medical care for premature neonates admitted to the neonatal intensive care unit.
Aim of the study: The current study aims to evaluate the effect of oral glucose administration 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 eighty preterm neonates divided into two equal groups (40 preterm neonates for oral glucose 25% and control groups) was conducted in the neonatal intensive care unit in Minia University Hospital for Obstetric and Pediatric.
Data collection tools: Two tools were used to collect data; the first tool was a structured interviewing questionnaire that includes part I, bio-demographic characteristics of preterm neonates, and part II, Baseline vital signs and oxygen saturation parameters, and the second tool was neonatal infant pain scale.
Results: The mean gestational age for oral glucose 25% administration and control groups were 33.7±1.6 vs. 34.1±1.8 weeks, respectively; more than half of studied preterm neonates were male. A significant decrease in the total mean score of neonatal infant pain scale in the oral glucose 25% administration group than in the control group (1.37±1.27, 4.5±1.27 from 7, respectively).
Conclusion: Oral glucose 25% administration is effective in pain reduction for preterm neonates during heel lancing.
Recommendation: Establish guidelines for pain assessment scales and pain management of neonates at the neonatal intensive care unit.

Keywords: Heel lancing, oral glucose, pain intensity, preterm neonates

Introduction
Preterm birth is defined by the World Health Organization (WHO), the American Academy of Pediatrics (AAP), and the American College of Obstetricians and Gynecologists (ACOG) as the delivery of a baby before 37 weeks of gestation. It affects 5–18% of pregnancies worldwide, equivalent to fifteen million preterm neonates each year **[1].** Preterm neonates need special care, so they are admitted to neonatal intensive care units (NICU) in a variety of numbers. The time spent in the NICU is crucial and delicate for the neural structure and brain development of newborns [2].
Preterm neonates in the NICU undergo many painful but necessary procedures during hospitalizations. The International Association for the Study of Pain (IASP) states that pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage. Pain in preterm may be induced by several diagnostic and therapeutic interventions [3, 4].
The heel-lancing procedure is a common tissue-damaging procedure routinely performed in premature neonates and causes pain. Although heel lancing is considered to be an easy process, it is repetition because of reasons like needling the heel, squeezing the heel to get the right amount of blood, the change in the quality of the sample, and its contamination or the sample is not enough, the process might take longer than normal. It may become painful and stressful for premature neonates [5]. Although preventing pain is the primary goal, in situations where procedural pain is inevitable, the reduction and effective management of pain is crucial for the developmental care of premature neonates and constitutes one of the key neuroprotective strategies.

Non-pharmacological methods are those that do not involve medication for pain management. Non-pharmacological methods in newborns can be applied alone or in combination with pharmacological methods [6, 7].

Most national and international guidelines on neonatal pain management declare pain assessment to be essential to achieve optimal pain and stress management. The rationale for this is to identify situations when neonates experience pain that should be treated and to avoid analgesic under or overtreatment **[8].** The purpose of a pediatric pain assessment is to determine how much pain the neonates are feeling. Pain assessment includes more than a number rating; understanding the intensity of the pain experienced by the neonate is essential for effective pain management [9].

The administration of oral glucose is the most commonly investigated non-pharmacologic intervention for the relief of procedural pain among neonates. Oral glucose solution has been used for the treatment of pain with good analgesic effect, especially for mild to moderate pain or as adjuvant therapy for severe pain. Oral glucose can help block or weaken the processing of cortical pain, which has been shown to have an analgesic effect on neonates. Glucose, which is more readily available in specific concentrations, has been suggested to have the same mode of action and similar analgesic effects as sucrose. So, it can be proposed as a simple and cost-effective alternative to sucrose [10].

Managing the pain of preterm neonates during painful procedures is a significant challenge for neonatal nurses. As a result, they play a significant role in pain assessment, prevention, and management to prevent its potentially negative effects. In this regard, nurses play a significant role in providing care; further, they can effectively perform the tasks of pain-relieving. They also must have enough information about examining and measuring pain intensity and complementary and non-pharmacological techniques to decrease pain [11].

Significance of the study

Preterm birth is a global epidemic that is the second leading cause of death for children under five years, behind pneumonia. It is also a major factor in long-term negative health outcomes. In Egypt, the most common cause of neonatal deaths was prematurity (39.4%), and according to the Egyptian Ministry of Health, 70% of deaths in the first year of life are caused by neonatal prematurity [12, 13].

During observation in clinical practice, the neonatal nurses were overwhelmed with many tasks in the NICU that did not allow them to assess pain in neonates fully. Hence, the current study is undertaken to help nurses use oral glucose as a non-pharmacological pain management. Hopefully, the results of the current study could help clinical neonatal nurses to apply non-pharmacological methods on preterm neonates during painful procedures. Moreover, providing evidence-based data that can develop nursing practice and research in the field of neonatal nursing to improve the quality of neonatal nursing care.

Aim of the Study

The present study aimed to evaluate the effect of oral glucose 25% administration on pain intensity among preterm neonates during heel lancing.

Research hypotheses

The current study results tested the following research hypotheses

H_0: There were no significant differences in oral glucose 25% administration on pain intensity among preterm neonates during heel lancing.

H_1: Preterm neonates who will receive oral glucose 25% administration before heel lancing will decrease pain intensity score.

Operational definition

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

Subject and method

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). The NICU of MUHOP is divided into three sectors; the first sector receives high-risk neonates when the delivery occurs in the same hospital and includes eleven incubators. The second sector receives high-risk neonates when delivered to another hospital or at an outpatient clinic and is composed of fourteen incubators. The third sector involves three incubators and receives high-risk neonates from the first and second sectors of the unit.

Sample: A Purposive sample was used to conduct the current study eighty (80) preterm neonates were included in the study and divided into forty cases for the study group and another forty cases for the control group. The preterm neonates included in the current study should have a gestational age between 34- < 37 weeks, Lack of receiving sedatives or tranquilizers 24 hours before and up to the end of the intervention, and preterm neonates that mothers willing to participate in the study.

Data Collection Tools

Two tools were used to collect the data

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

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

Part two: Baseline of 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 was developed by Lawrence *et al*. (1993) and is appropriate for neonates aged 28-40 weeks of gestational age. It includes six items: facial expressions, arms, cries, legs, breathing patterns, and state of arousal **[14].**

Scoring system

Neonatal Infant Pain Scale scored zero to one for facial expression, arm, leg, breathing pattern, and state of arousal

items, respectively, while it scored zero to two for cry items. Total pain sore from zero to two was referred to as no pain, from three to four was referred to as moderate pain, and while more than four was referred to as severe pain.

Validity and reliability

Data collection tools were developed after an extensive review of the literature. Five panel experts in pediatric nursing reviewed the tools to test the content validity of the tool and necessary modifications were made to the tools. The reliability of the tool was performed to confirm its internal consistency by Cronbach alpha test 0.92.

Ethical consideration

A written initial primary approval was obtained from the research ethical 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 from the beginning of May 2022 on eight 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 made (current weight of preterm neonates, age at the time of study), and pilot study cases were excluded from the total cases.

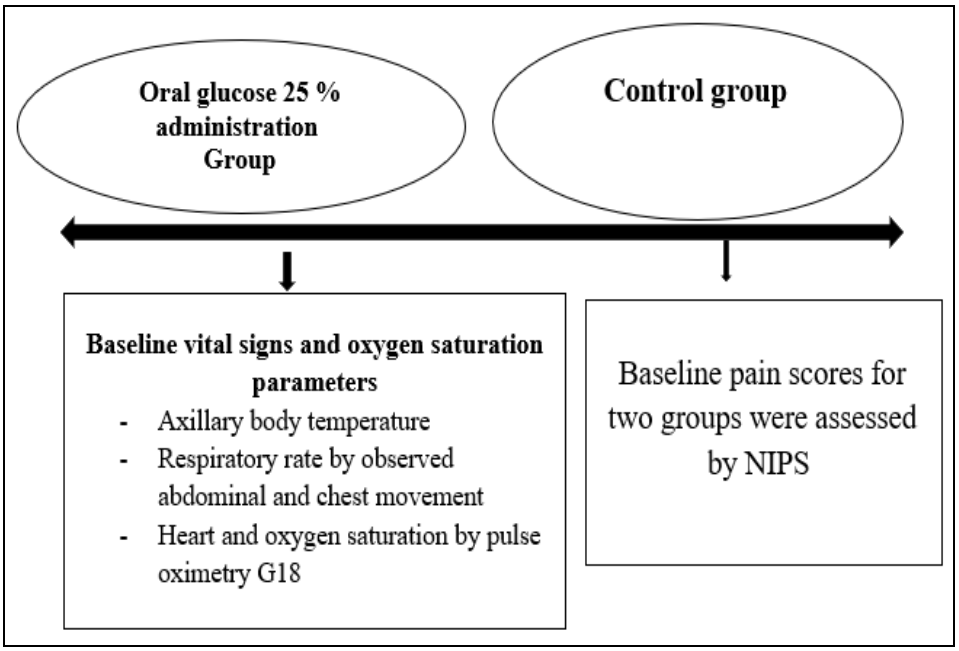
Data Collection Procedures

The researchers adopted the following sequences to conduct the study

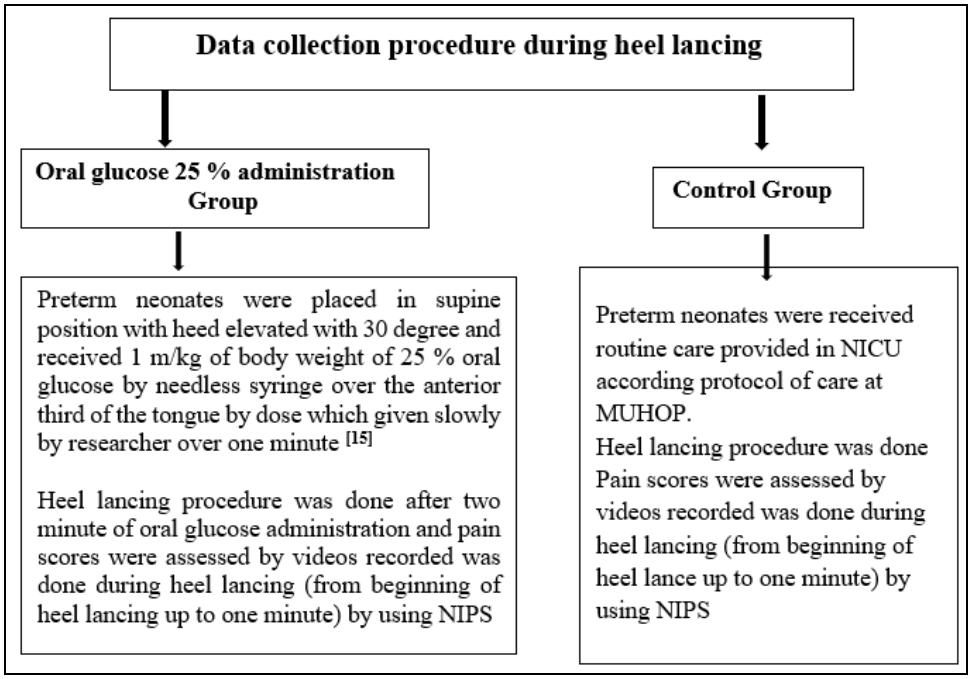
Before the intervention procedure: An interview was conducted with the mothers of the preterm neonates who were accompanied at the time of the procedure to explain the aim of the study and obtain permission to include their preterm neonates in the current study. The researchers explained the aim and the content of the sheet to mothers, reassuring them that the procedure was safe and inviting them to participate. 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.

Data collection was conducted over six months, from the beginning of June 2022 to the beginning of December 2022, after the ethical committee for the Faculty of Nursing of Minia University approved until the end of data collection. The researchers attended Saturday and Sunday/ week at the NICU of Minia University Hospital for obstetric and pediatric and collected about 4-6 cases/ week.

I: Data collection procedure before heel lancing



II: 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 were expressed descriptively through the use of numbers and percentages. Quantitative data were presented by mean and standard deviation. Quantitative continuous data were compared using a t-test to compare the two 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 Pearson correlation test was used to detect the significance and degree of association between the quantitative variables of the two groups. The level of significance was accepted at a p-value < 0.05.

Results

Table 1: Bio-demographic characteristics of the studied preterm neonates among oral glucose 25% administration and control group (N=80)

Characteristics of preterm	Groups				T-Test	P-Value
	Oral glucose (N=40)		Control (N=40)			
Gestational age of preterm per weeks						
Mean ± SD	33.7±1.6		34.1±1.8		0.013	0.991 NS
Mini-Maxi	31-36		31-36			
Gender of the studied preterm neonates						
Male	26	65.0	22	55.0	X^2 0.833	0.361
Female	14	35.0	18	45.0		
Age at the study of preterm neonates per day						
Mean ± SD	5.42±3.07		4.37±2.61		0.162	0.886 NS
Mini-Maxi	1-10		1-10			
Birth weight in gram						
Mean ± SD	1984.5±351.6		2010.7±668.1		0.175	0.877 NS
Mini-Maxi	1400-3180		1320-3050			
Current weight of preterm at study per gram						
Mean ± SD	1960.2±381.7		1970±604.8		0.111	0.921 NS
Mini-Maxi	1400-3140		1320-2970			
Mode of delivery of studied preterm neonates						
Vaginal delivery	16	40.0	19	47.5.0	X^2 0.457	0.499
Caesarian section	24	60.0	21	52.5.0		
Medical diagnosis of the studied preterm neonate						
Respiratory Distress	28	70.0	23	57.5	X^2 1.531	0.465 Ns
Jaundice and respiratory distress	8	20.0	10	25.0		
Infant of a diabetic mother	4	10.0	7	17.5		

NS=No Significant Difference

Table 1 shows that the mean gestational age of studied preterm neonates between oral glucose 25% and control group is 33.7±1.6, 34.1±1.8 weeks respectively, 65%, 55% of both groups are male, respectively. The mean age of the preterm neonates of oral glucose 25% is 5.42±3.07 days compared to 4.37±2.61 days in the control group. Additionally, the mean birth weight in oral glucose was 25%, and the control groups were 1984.5±351.6 and 2010.7±6681 grams, respectively. Also, the mean current weight of oral glucose 25%, and the control groups are

1960.2±381.7 and 1970±604.8 grams, respectively. In this context, 60% and 52.5% of both groups were delivered by the caesarian section, respectively, 70% and 57.5% of the two groups were admitted to neonatal intensive care unit with respiratory distress, respectively. Finally, there is no statistically significant difference between the two groups regarding the bio-demographic characteristics of preterm neonates**.**

Table 2: Baseline mean vital signs and oxygen saturation parameters of the studied preterm neonates among oral glucose 25% and control groups before heel lancing (N=80).

Vital signs and oxygen saturation	Groups		T-Test	P-Value
	Oral glucose 25% (N=40)	Control (N=40)		
Heart rate				
Mean ± SD	153±16.2	150±23.6	0.024	0.983 NS
Respiratory rate				
Mean ± SD	56.0±8.5	55.5± 9.4	0.0006	0.996 NS
Body temperature				
Mean ±SD	37.0± 0.23	37.0±0. 20	0.0058	0.999 NS
Oxygen saturation				
Mean ± SD	97±0.8	97±0.78	0.0002	0.998 NS

Table 2 indicates that the mean heart rate in the oral glucose 25% group is 153±16.2 beats/ minute, comparable with 150±23.6 beats/ minute in control groups, and the mean respiratory rate for the two groups are 56.0±8.5, 55.5±9.4 breath/minute, respectively. Additionally, the mean degree of the body temperature of oral glucose 25% is 37.0±0.23 ^{o}C in comparison with 37.0±0.20 ^{o}C in the control group, and the mean oxygen saturation for both groups are 97.28±0.8, 97.26±0.78, respectively. Lastly, there is no statistically significant difference regarding all vital signs and oxygen saturation parameters at a baseline between both groups before heel lancing, respectively.

Table 3: Neonatal infant pain scale items in the studied preterm neonates before and during heel lancing between oral glucose 25%, and control groups (N=80)

Items of neonatal infant pain scale	Before Heel Lancing				χ^2	P Value	During Heel Lancing				χ^2	P-Value
	Oral glucose (N=40)		Control (N=40)				Oral glucose (N=40)		Control (N=40)			
	No	%	No	%			No	%	No	%		
Facial expressions of NIPS												
Relaxed	37	92.5	39	97.5	1.053	0.305	24	60.0	3	7.5	24.654	0.0001**
Grimace	3	7.5	1	2.5			16	40.0	37	92.5		
Cry characteristics of NIPS												
No Cry	40	100.0	40	100.0	……	1.000	26	65.0	10	25.0	13.952	0.0009**
Whimper	0	0.0	0	0.0			14	35.0	24	60.0		
Vigorous Cry	0	0.0	0	0.0			0	0.0	6	15.0		
Breathing pattern of NIPS												
Relaxed	39	97.5	39	97.5	…….	1.000	33	82.5	30	75.0	0.672	0.412 **NS**
change of breathing	1	2.5	1	2.5			7	17.5	10	25.0		
Arm character in NIPS												
Relaxed/ restrained	38	95.0	37	92.5	0.213	0.644	30	75.0	3	7.5	37.602	0.0001**
Flexed/ Extended	2	5.0	3	7.5		**NS**	10	25.0	37	92.5		
Leg characteristics of NIPS												
Relaxed/ Restrained	40	100.0	38	95.0	0.346	0.556	36	90.0	5	12.5	48.081	0.0001**
Flexed/ Extended	0	0.0	2	5.0		**NS**	4	10.0	35	87.5		
State of arousal of NIPS												
Sleeping/ awake	40	100.0	38	95.0	0.346	0.556	37	92.5	14	35.0	28.614	0.0001**
Fussy	0	0.0	2	5.0		NS	3	7.5	26	65.0		

Table 3 observes that there is no statistically significant difference among the studied preterm neonates in oral glucose 25% and control groups regarding all items of the neonatal infant pain scale before heel lancing, respectively. On the other hand, 60% of the oral glucose 25% group appeared to react with a relaxed face compared with 92.5% of the control group, which appeared to grimace during heel lancing. Additionally, 65% of the oral glucose 25% group presented with no cry during heel lancing, while 60% of the control group presented with a whimper. On the same line, 75% and 90% of the oral glucose group reacted with relaxed arms and legs during heel lancing compared with 92.5% and 87.5% of the control group reacted with extended/flexed arms and legs. On the same line, 92.5% of the oral glucose 25% group responded with sleep/ awake during heel lancing; however, 65% of the control group showed a fussy appearance. In the end, a highly statistically significant difference between the oral glucose 25% group and the control group regarding all items of the neonatal infant pain scale during heel lancing (P=0.0001, P=0.001, P=0.0001, P=0.0001, p=0.0001 respectively) except respiratory pattern *(*P=0.109).

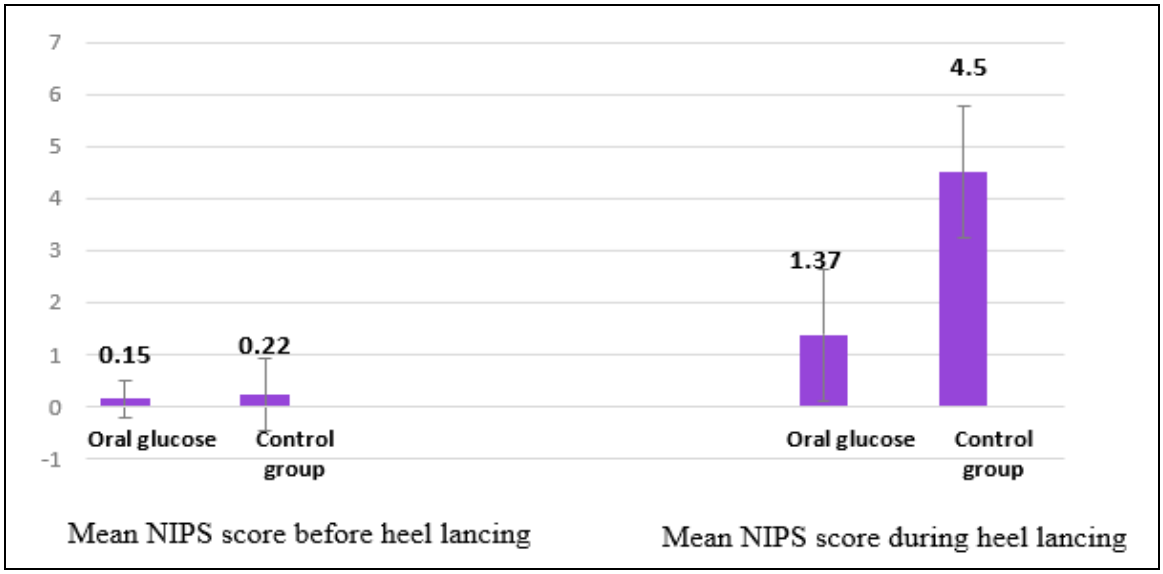


Fig 4: total mean score of the neonatal infant pain scale of the studied preterm neonates among oral glucose 25% and the control groups (N=80)

Figure 4 Justifies that there is no statistically significant difference between the studied preterm neonates among oral glucose 25%5 and control groups regarding the total mean of neonatal infant pain scale before heel lancing. On the other hand, markedly decline in the total mean of neonatal infant pain scale in the oral glucose 25% group than in the control group with a highly statistically significant difference (P=0.0001).

Table 4: Correlation between bio-demographic characteristics of the studied preterm neonates with NIPS before and during heel lancing (N=80)

Items		Groups			
		Oral glucose 25%		Control	
		Total NIPS before heel lance	Total NIPS during heel lance	Total NIPS before heel lance	Total NIPS during heel lance
Gestational age of preterm per weeks	**r**	-0.244	-0.302	-0.128	**-0.560**
	P-Value	0.129	0.058	0.430	0.0001**
Age at the time of study of preterm per days	r	0.287	0.318	-0.104	-0.068
	P-Value	0.073	0.046*	0.525	0.675
Birth weight in gram	r	-0.147	-0.234	-0.274	-0.547
	P-Value	0.365	0.147	0.087	0.0001**
Current weight in gram	r	-0.188	-0.270	-0.268	-0.524
	P-Value	0.246	0.092	0.095	0.001*

Table 4 indicates that oral glucose group table 9 indicates a fair positive association between age at the time of study of preterm and total NIPS (r = 0.318 P=0.046). On the other hand, in the control group, there is a moderate negative correlation between (gestational age of preterm per week, birth weight in gram, current weight in gram) with total NIPS during heel lancing (r = -0.560, P=0.0001, r = -0.547, P=0.0001, r = - 0.524, P=0.001 respectively).

Discussion

Oral glucose solutions before painful procedures are known to have an analgesic effect on preterm and term neonates. The effects of glucose solutions are thought to be mediated by endogenous endorphin dispersal, which contributes to the modulation of the pain pulse at the level of the spinal cord, with the effect of relieving pain. Furthermore, the sense of sweet taste slows down the heart rate as a result of the increase in vagal tone, which is induced by the stimulated endogenous opioid system [15]. The current study proved that there was no statistical significance regarding bio-demographic characteristics of studied preterm neonates between oral glucose 25% and control groups. This finding is comparable with Angeles *et al.* (2020) [17], who evaluated the effect of "Oral dextrose reduced procedural pain without altering cellular ATP metabolism in preterm neonates." They confirmed that, no statistically significant difference among studied groups regarding the demographic and clinical characteristics of preterm infants **[17]**. Researchers referred to this finding as homogenous characteristics among oral glucose 25% and control groups.

The current study showed that there was no statistically significant difference in oral glucose 25% and control groups regarding baseline vital signs and oxygen saturation parameters. This finding is compatible with a randomized controlled trial conducted by Akkaya-and Özyazıcıoğlu (2024) [18], who assessed the "Effect of pacifier and pacifier with dextrose in reducing pain during orogastric tube insertion in newborns." They noted that no statistically significant difference in the studied groups regarding vital signs and oxygen saturation [18]. According to the researchers' point of view, this finding is related to the proper atmosphere around neonates in neonatal intensive care units and the homogenous characteristics of both groups, which promote the stability of preterm neonates.

Concerning facial characteristics of NIPS, the present study revealed that approximately two-thirds of oral glucose (25%) was in a relaxed face during heel lancing. At the same time, the majority of the control group reacted by grimacing during heel lancing. This result contradicted with a randomized clinical trial conducted by Lima *et al*. (2017) [19], who studied "Glucose solution is more effective in relieving pain in neonates than non-nutritive sucking." They proved that more than two-thirds of the oral glucose group presented with a grimace attitude during the intervention [19].

Regarding crying characteristics of the neonatal infants' pain scale, a cry is considered a strong positive response of premature neonates to pain; the present study revealed that approximately two-thirds of the oral glucose 25% group do not cry heel lancing, while more than half of the control group presented by whimper appearance during heel lancing. This finding is consistent with a randomized quadruple-blinded experimental study executed by Ugucu *et al*. (2024) [6], who assessed the "Effect of combining oral glucose solutions with supportive positions on pain during heel puncture blood sampling in premature infants." They revealed that administering oral glucose solutions in different concentrations (10%, 20%, 30%) together with supportive positions was effective in reducing the total crying times associated with the heel puncture blood sampling in premature infants [6].

Additionally, in a cumulative meta-analysis conducted by Harrison *et al*. (2017) [20], they assessed "Sweet Solutions to Reduce Procedural Pain in Neonates". They documented that administration of sweet solutions was reported to be superior to placebo in reducing crying times in neonates. According to the researchers' point of view, based on the current study findings, oral glucose 25% could be considered a safe intervention that helps to alleviate stress level and decrease behavioral signs of pain [20].

Considering arm and leg characteristics of NIPS, the present study indicated that a high percentage of the oral glucose group reacted by relaxed arm and leg during heel lancing. This result was in agreement with a randomized clinical trial published by Lima *et al*. (2017) [19], who assessed "Glucose solution is more effective in relieving pain in neonates than non-nutritive sucking." They declared that two-thirds of the oral glucose group presented with relaxed arms and legs during the intervention [19].

Regarding the state of arousal of NIPS, the present study documented that most of the oral glucose group presented with sleep/awake during heel lancing. This result is consistent with a previous study conducted by Kheir *et al*. (2017) [21], who evaluated 'The Analgesic Effect of Oral Glucose and Breast Feeding during Procedural Pain in Neonates". They confirmed that less than one-fourth of glucose-feeding neonates presented with active/ sleep during procedural pain [21].

The present study reflected no statistically significant difference regarding the total mean score of NIPS before heel lancing between oral glucose 25% and control groups before heel lancing, while markedly decreased total mean score of NIPS in the oral glucose 25% group than in the control group, this finding rejects the null hypothesis. This result was in agreement with a randomized controlled trial conducted by Tekgündüz *et al*. (2019) [22], who studied "oral glucose and listening to lullaby to decrease pain in preterm infants supported with NCPAP." They confirmed that there were no statistically significant differences regarding the total mean score of NIPS among studied groups before the intervention, while the total mean score of NIPS during and after the intervention was markedly decreased in the oral glucose group compared to the control group [22].

Similarly, Dehghani *et al*. (2019) [23] studied "the Effect of Yakson Touch and Oral Glucose on the Severity of Phlebotomy Pain in Preterm Infants." They highlighted that no statistically significant differences among 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 oral glucose decreased more than in the control group after phlebotomy [23].

Additionally, Mehmood *et al*. [24] evaluated "the Mean Effect of Oral 25% Glucose Solution for Pain Relief in Term Infants, as Compared with Control Group, During Venipuncture". They found no statistically significant difference before the procedure among the studied group. They revealed the total mean NIPS in the oral glucose group obviously decreased after 10 minutes of intervention than in the first one minute after intervention in the oral glucose group [24].

Regarding correlation, the present study clarified a fair positive association between age at the time of study of preterm and total NIPS in the oral glucose 25% group. Additionally, in the control group, a moderate negative correlation between (gestational age of preterm per week, birth weight in grams, current weight in grams) with total NIPS during heel lancing. This finding was consistent with a crossover clinical trial study executed by Silveira *et al*. (25), who assessed the effect of glucose and non-nutritive sucking on puncture pain in premature infants". They pinpointed a significant negative correlation between birth weight and total pain score [25].

In this context, this result was found to be consistent with Miller (2009) [26], who studied "non-nutritive sucking and sucrose-induced analgesia: effect on heart rate, oxygen saturation, and pain in intubated infants." He reported a relatively strong correlation between birth weight (in grams) and both heart rate and oxygen saturation [26].

On the other hand, d'souza (2019), who studied the effect of facilitated tucking in reducing the pain response during venipuncture among preterm neonates admitted to the neonatal intensive care unit (NICU) in a selected pediatric hospital, Mangaluru, confirmed that no significant association between demographic variables of preterm neonates and the level of pain during venipuncture in experimental and control groups [27].

Conclusion

The finding concluded that the total mean score of neonatal infant pain scale among studied preterm neonates was decreased in the oral glucose 25% group than in the control group, which confirmed that oral glucose 25% administration is effective in pain reduction during heel lancing among preterm neonates**.**

Recommendations

- Enhancing the application of non-pharmacological pain management in NICU
- Provide training program to neonatal nursing staff to

help them use safe oral glucose 25% in nursing practice.
- Establish guidelines for pain assessment scales and pain management of neonates at the neonatal intensive care unit.
- Conduct further study to ensure the applicability and safety of using oral glucose in clinical practice.
- Participate neonates' mother in non-pharmacological pain management of their neonates with concern of oral glucose 25% administration

References

1. Algameel A, Aly RM, Abo Elnasr M, Fathy A. Outcome of late preterm newborns in Upper Egypt. Egyptian Pediatric Association Gazette. 2020;68:1-11.
2. ElGhany-Abd El-Fatah A, Mahmoud AEM. Effect of simulative heartbeat nest on improving physiological parameters, comfort, and pain of preterm neonates at neonatal intensive care unit. Journal of Nursing Science Benha University. 2023;4(1):1244-1261.
3. Magor NRE, Ads SEM, Elhalafawy SEH. Effectiveness of nesting positioning and Yakson touch on physiological, behavioral state and pain caused by blood sampling procedures in preterm neonates. Journal of Neonatal Nursing; c2024.
4. Canepa ME, Raffini L, Ramenghi LA. Terminology matters is the International Association for the Study of Pain definition of pain fully satisfactory for fetuses, neonates, and infants? Frontiers in Pain Research. 2024;5:1369945.
5. Yilmaz D, Inal S. Effects of three different methods used during heel lance procedures on pain level in term neonates. Japan Journal of Nursing Science. 2020;17(4).
6. Ugucu G, Yigit R, Celik Y. Effect of combining oral glucose solutions with supportive positions on pain during heel puncture blood sampling in premature infants: A randomized quadruple-blinded experimental study. Journal of Pediatric Nursing; c2024.
7. Antepli NA, Kocamaz EB, Güngörmüş Z. The effect of vibration on pain during heel lance procedures in newborns: A randomized controlled trial. Advances in Neonatal Care. 2022;22(2).
8. Yeo CM, Johnston CC, Disher T, *et al*. The influence of skin-to-skin contact on cortical activity during painful procedures in preterm infants in the neonatal intensive care unit (iCAP mini): Study protocol for a randomized control trial. Trials. 2022;23(1):512.
9. Hockenberry MJ. Wong's Nursing Care of Infants and Children-E-Book. 11th ed. St. Louis: Elsevier Health Sciences; c2022.
10. Matar EM, Arabiat DH, Foster MJ. Oral glucose efficacy on neonate's pain responses at the NICU: A quasi-experimental trial of two clinical procedures. Applied Nursing Research. 2016;32:36-40.
11. Hockenberry MJ, Wilson D, Rodgers CC. Wong's Essentials of Pediatric Nursing-E-Book. 10th Ed. St. Louis: Elsevier Health Sciences; c2021.
12. Silva RS, de Carvalho SM, Meirelles BHS, de Oliveira Pacheco S. Practices of nurses for the care of premature in neonatal intensive care unit: A literature review. Archives of Current Research International. 2020;20(5):24-30.
13. El-Ganainy HFR, El-Monayeri G, Ahmed MA, Gadallah MA. Risk factors for neonatal mortality in neonatal intensive care units in Tanta City. The Egyptian Journal of Hospital Medicine. 2019;75(1):1996-2006.
14. Lawrence J, Alcock D, McGrath P, Kay J, MacMurray SB, Dulberg C. The development of a tool to assess neonatal pain. Neonatal Network. 1993;12(6):59-66.
15. Ramar P, Vinayagam P, Seeralar A. Effectiveness of oral glucose as analgesic for neonates undergoing retinopathy of prematurity screening-A randomized pilot study for a parallel randomized control trial. Journal of Clinical Neonatology. 2019;8(4):238-242.
16. Uzelli D, Yapucu Güneş Ü. Oral glucose solution to alleviate pain induced by intramuscular injections in preterm infants. Journal for Specialists in Pediatric Nursing. 2015;20(1):29-35.
17. Angeles DM, Gunderson N, Alvarado S, *et al*. Oral dextrose reduced procedural pain without altering cellular ATP metabolism in preterm neonates: a prospective randomized trial. Journal of Perinatology. 2020;40(6):888-895.
18. Gül AA, Özyazıcıoğlu N. Effect of pacifier and pacifier with dextrose in reducing pain during orogastric tube insertion in newborns: a randomized controlled trial. Journal of Perinatology. 2024;44(5):717-723.
19. Lima A, Oliveira K, Mezzacappa MA, Moreira AC. Glucose solution is more effective in relieving pain in neonates than non-nutritive sucking: a randomized clinical trial. European Journal of Pain. 2017;21(1):159-165.
20. Harrison D, Larocque C, Bueno M, Stokes Y, Turner L, Hutton B. Sweet solutions to reduce procedural pain in neonates: A meta-analysis. Pediatrics. 2017;139(1).
21. Kheir AEM, Abunura FMA, Attyia EO. The analgesic effect of oral glucose and breastfeeding during procedural pain in neonates. Sudan Journal of Medical Sciences. 2017;12(3):134-139.
22. Tekgündüz KŞ, Inal S, Günay U. Oral glucose and listening to lullaby to decrease pain in preterm infants supported with NCPAP: A randomized controlled trial. Pain Management Nursing. 2019;20(1):54-61.
23. Dehghani K, Haghighi BN, Allahgholipour A, Hasani M. Comparison of the effect of Yakson touch and oral glucose on the severity of phlebotomy pain in preterm infants. Iranian Journal of Neonatology. 2019;10(4):16-21.
24. Mehmood RUB, Khawar MB, Muhammad J, Iftikhar M. Evaluate the mean effect of oral 25% glucose solution for pain relief in term infants, as compared with control group, during venipuncture. Pakistan Armed Forces Medical Journal. 2023;73(5):1242-1244.
25. Silveira ALD, Soares MDO, Jesus CA, Barreto A. The effect of glucose and non-nutritive sucking on puncture pain in premature infants: a crossover clinical trial. Revista da Escola de Enfermagem da USP; c2021, 55.
26. Miller HD. Non-nutritive sucking and sucrose-induced analgesia: Effect on heart rate, oxygen saturation, and pain in intubated infants. Advances in Neonatal Care. 2009;9(4):188-194.
27. D'Souza RA. A study on the effect of facilitated

tucking in reducing the pain response during venipuncture among preterm neonate admitted in neonatal intensive care unit (NICU) in a selected pediatric hospital, Mangaluru. Rajiv Gandhi University of Health Sciences (India); c2019.

How to Cite This Article
Omar MF, Masoad ES, Saleh SM, Aboelmagd AN. Effect of oral glucose administration on pain intensity among preterm neonates during heel lancing. International Journal of Research in Paediatric Nursing. 2024;6(2):52-60.