

Comparison of the Effect of Yakson Touch and Oral Glucose on the Severity of Phlebotomy Pain in Preterm Infants

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ABSTRACT

Background: Infants are exposed to different painful procedures during hospitalization in the neonatal intensive care unit (NICU). Due to the harmful effects of pain on infants, NICUs require methods by the aid of which the pain in infants can be controlled. Yakson touch and oral glucose are among non-pharmacological methods for pain relief in infants. In this regard, the present study was conducted to compare the effect of Yakson touch and oral glucose on the severity of phlebotomy pain in preterm infants.

Methods: In this randomized clinical trial, 99 preterm infants hospitalized in NICU were randomly allocated to three groups, including Yakson touch (n=33), oral glucose (n=33), and control (n=33). In the oral glucose group, 1 cc of 50% glucose was orally given to the infants 1 min before phlebotomy. In the Yakson touch group, touching was performed for 5 min, and then the phlebotomy was performed. The infants in the control group did not receive a specific treatment. Infant pain level was determined before and after the phlebotomy using video recording based on Neonatal Infant Pain Scale. The data were analyzed using the analytical statistical tests, including the analysis of variance, Chi-square, Wilcoxon, and Kruskal-Wallis, in SPSS software (version 20).

Results: The mean scores of pain in the two experimental groups were significantly lower than that of the control group (P=0.001), but there was no significant difference between the two experimental groups (P>0.05).

Conclusion: According to our findings, both two methods (i.e., Yakson touch and oral glucose) can reduce phlebotomy pain in preterm infants hospitalized in intensive care unit. It is recommended to use Yakson touch in case of lack of access to glucose.

Keywords: Oral glucose, Pain, Phlebotomy, Preterm infant, Yakson touch

Introduction

Every year, 15 million premature infants are born worldwide (1). The survival of preterm infants has increased significantly with advances in medical care. Therefore, these infants are exposed to lots of stress in their infancy (2). Each preterm infant during the first 2 weeks of life is exposed to 14 painful procedures each day on average in the neonatal intensive care unit (NICU), and only one-third of preterm infants receive enough pain-relieving treatments (3). At this time, the big concern is that the invasive procedures,

including repeated phlebotomy, may impact central nervous system due to creating pain (4).

Pain is an unpleasant psychological and sensory experience that is accompanied by tissue damage (5). The American Pain Society has considered pain to be the fifth vital sign that should be daily controlled (6). In the past, it was believed that newborns do not feel pain or feel less pain than adults. However, it is currently known that the pain-transmitting fibers are formed in prenatal development (7). The time of

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cerebral cortex afferent nerve pathway formation is between 20 and 26 weeks of gestation (8). Pain threshold in infants and especially preterm infants is low, and infants show severe responses to painful procedures (9).

The short-term effects of the pain include reduced oxygenation, hemodynamic instability, and increased intracranial hypertension. The long-term effects of the pain include anxiety, pain hypersensitivity, irritability, sleep disturbance, reduced nutrition, and delay in body immune system activity, disturbance in emotional relationships, hyperactivity, and attention deficit (6, 10-13).

The mortality rate of infants exposed to severe and long-term pain increases. In addition, the infants that experienced pain will have different responses to painful events in the future (14). Therefore, the prevention and control of pain in infants should be considered as a part of routine nurse care. On the other hand, nowadays nurses should have evidence-based performance and update their presented care based on suggestions verified in studies (15-16).

Pain control can be done using pharmacological and non-pharmacological interventions. Using pain relievers and analgesics for reducing the pain of short-term procedures in infants is questionable as these drugs usually have low effects and potential side effects, such as cardiorespiratory depression. Non-pharmacological strategies for pain relief are not only easy, cheap, and usable without prescription by a physician but also well-tolerated by infants (17-19).

The results of different studies point out the use of non-pharmacological methods in the treatment of infant problems to be lower than 2% to over 20-30% most of which is used for the treatment of infant's pains (20). Appropriate sampling techniques may be effective in pain relief, but the use of a pain-relieving method during phlebotomy for reducing stress in infants is recommended (21).

Some studies indicate that the prescription of sweet oral solutions will reduce pain symptoms during painful procedures (22-24). This occurs for two reasons. One reason is the release of endorphin, and the other is the mechanism before the absorption of sweet taste (25, 26). Another non-pharmacological method for pain reduction is the use of sensory stimulation and touch. Touching is a basic human need, and if it is done gently and calmly, it can have therapeutic effects (27) and effectively reduce infant's pain (28).

Yakson touch is a Korean touch therapy. Yak

means medicine and son means boy that refers to hand. The protocol includes warm hands, touch without pressure, and slow hand movement in a way that is appropriate for a preterm infant (29, 30). Yakson touch can result in relaxation and consequently better growth of an infant, improved sleep quality (31), and mother attachment (32).

There are few studies conducted on the effect of Yakson touch on preterm infant pain, and there have been suggestions for performing more studies in this domain (33). Furthermore, the effect of oral glucose has been studied less frequently (34). Moreover, the results of 14 papers on the effect of comestible sweet solutions on pain relief in infants in different therapeutic methods indicated the effect of comestible sweet solutions on infant pain. However, due to the lack of control of study variables, final conclusion has not been possible (35). Therefore, the present study aimed to compare the effect of Yakson touch and oral glucose on the severity of phlebotomy pain in preterm infants.

Methods

This randomized clinical trial was conducted in the NICU of Shahid Sadoughi Hospital of Yazd, Iran, from May 2018 to August 2018. This hospital is one of the largest educational hospitals in Yazd, and its NICU is the only training unit. According to a previous study (30) with confidence interval of 95% and test power of 80%, the sample size for each group was determined at 33 using the following equation; therefore, a total of 99 newborns were enrolled in the study (Figure 1).

$$n = \frac{\left(z_{\frac{\alpha}{2}} + z_{\beta}\right)^2 \times 2s^2}{(x1 - x2)^2}$$

The inclusion criteria were the gestational age of 34-37 weeks, lack of previous painful intervention immediately before the study, lack of receiving sedatives or tranquilizers 24 h before and up to the end of the intervention, lack of congenital disorder, intracranial hemorrhage or neurological problems, and need of heel stick test. The exclusion criteria were addicted mother's infants, under mechanical ventilation infants, diabetic mother's infants, and history of hypothermia, hypoglycemia, surgery, and 5-minute Apgar score of lower than 7. Attrition criteria were more than one try for phlebotomy and occurrence of apnea during that.

After obtaining informed written consent from the parents, the neonates were selected via

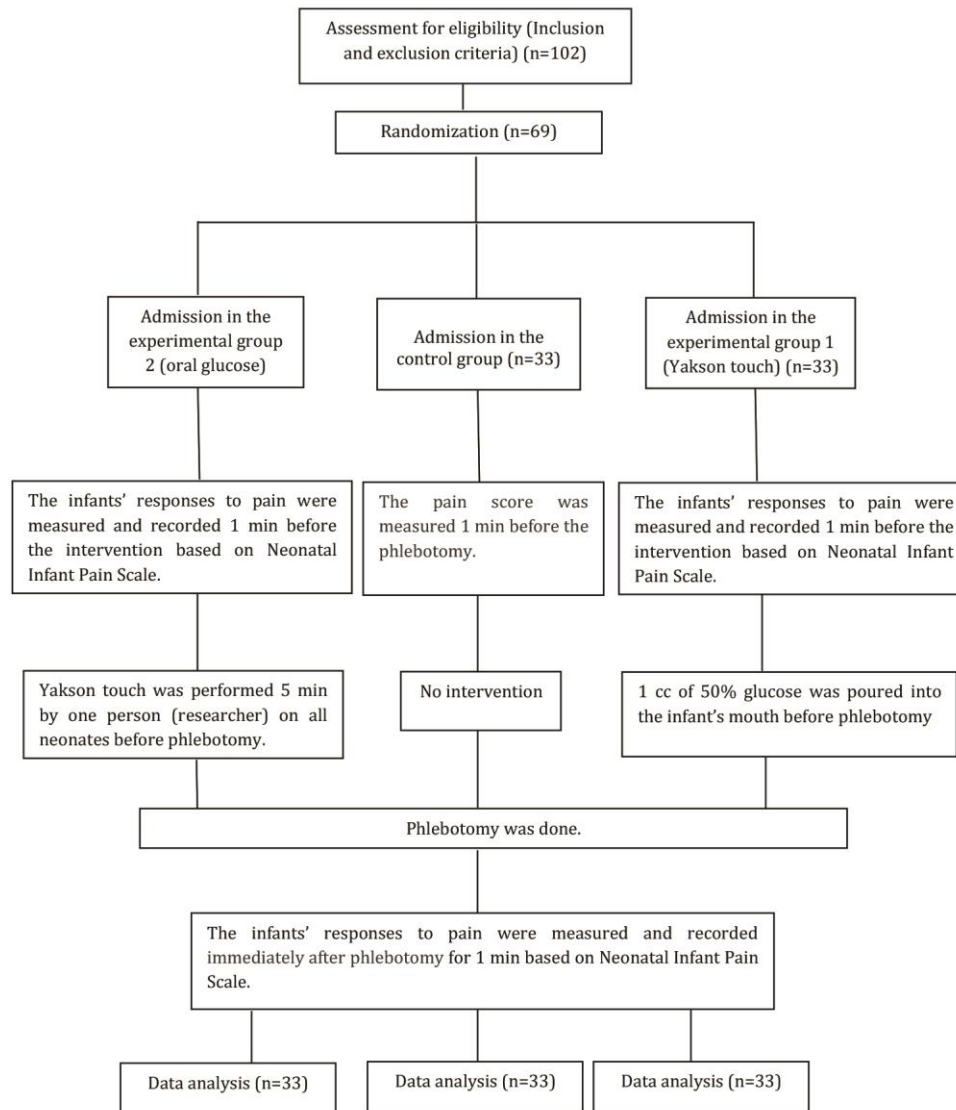


Figure 1. Flowchart of present study

convenience sampling in accordance with the inclusion-exclusion criteria and then randomly allocated into the three groups by random allocation software. In Yakson touch (group 1), the researcher after washing her hands with antimicrobial materials warmed her hands with a radiant heater. Then, the researcher calmed both arms and the muscles of both shoulders for one min and took a deep breath to have energy at her palm.

Yakson touch takes 5 min, including 1 min of hand rest, 3 min of gentle petting, and 1 min of opening hand. The researcher is continuously touching the infant during touching the hand and all the fingers. The researcher lifts the infant in a way that her left hand is placed under the infant,

and her right hand is placed on the infant's abdomen. The infant's top of abdomen is touched clockwise in a circle with a diameter of about 4 cm every 5 sec.

The touching method was according to a previous study by Im H et al. (2008) (30) and was applied on all neonates by one researcher nurse. Before the initiation of the study, one of the researchers (Akram Bagheri) was trained for Yakson protocol. The researcher nurse performed it three times under the supervision of the research supervisor (Khadije Dehghani) to ensure the integrity of the intervention. Phlebotomy was performed 1 min after the end of the touch. In the other group, 1 cc of 50% glucose was poured into the infant's mouth 1 min before phlebotomy.

The infants in the control group (group 3) received no intervention. All the phlebotomy conditions, such as phlebotomist, automatic blood collection device (EASY GLUCO made in South Korea), puncture place (i.e., external side part of the heel), material used, and disinfection method, were the same in all the three groups. For phlebotomy, the infant's heel was disinfected with 70% isopropanol, and the lancet was inserted in the side part of the heel. Phlebotomy was done by a nurse with at least 5 years of experience.

The infants' responses to pain were measured and recorded 1 min before the intervention and immediately after phlebotomy for 1 min based on Neonatal Infant Pain Scale (NIPS) in two intervention groups. In the control group, the pain score was measured and recorded 1 min before and just after the completion of phlebotomy for 1 min.

In order to determine the pain score, the video recording of the infants' faces and bodies was done by the researcher's colleague using Canon A2300 made in Canada. The videos were watched and scored by one person for all the neonates with a master's degree in nursing with 10 years of clinical experience who did not know about the objectives and groups of the study.

The NIPS is used for measuring pain in preterm and term infants up to 6 weeks of age. This scale explores crying, facial expression, breathing patterns, arms and legs movements, and state of arousal. In this scale, crying is scored (0, 1, and 2) 0: no cry, 1: whimper, and 2: vigorous crying. Facial expression is scored (0, 1) 0: relaxed and 1: grimace. Breathing pattern is scored (0, 1) 0: relaxed and normal, as well as 1: change in breathing. Arms and legs movements are scored (0, 1) 0: normal and 1: flexed and extended. State

of arousal is scored (0, 1) 0: sleeping or awake and relaxed, as well as 1: fussy. The score range in this tool is reported within 0-7. Validity and reliability of this tool were verified according to the studies by Lawrence et al. (1993) and Boroumandfar et al. (2013) (36, 37).

Data analysis was performed in SPSS software (version 20) using the Kolmogorov-Smirnov, Chi-square, analysis of variance (ANOVA), Kruskal-Wallis, and DUNN tests. P-value less than 0.05 was considered significant. This study was approved by the Ethics Committee of Shahid Sadooghi University of Medical Sciences of Yazd (IR.SSU.REC.1397.019) and registered in the Iranian Registry of Clinical Trials (IRCT39262). In addition, a written informed consent was obtained from the parents of the neonates.

Results

This study was conducted on 99 preterm infants hospitalized at the NICU of Shahid Sadooghi Hospital of Yazd. The samples were randomly assigned into three groups of Yakson touch, oral glucose, and control group, each with 33 subjects. The infants were 45 females and 54 males, and in terms of delivery type, 47 and 52 cases were born through natural and cesarean deliveries. In addition, 5-minute Apgar score of the studied infants varied from 7 to 10. The birth weights of the infants were from 1320 to 2630 g. The gestational age of the infants ranged from 34 to 37 weeks, and the infants' age at the time of phlebotomy ranged from 4 to 14 days.

According to ANOVA test, no significant difference was seen among the three groups in terms of gestational age, birth weight, 5-minute Apgar score, and infant age (Table 1). There was no significant difference among the groups in

Table 1. Mean of demographic characteristics of the studied infants according to group

Variable	Group	n	Mean	Standard deviation	P*
Weight (g)	Control	33	1876.97	347.000	0.151
	Comestible glucose	33	2028.48	423.874	
	Yakson touch	33	1872.12	326.226	
	Total	99	1925.86	371.563	
5-minute Apgar score	Control	33	8.30	0.770	0.820
	Comestible glucose	33	8.39	0.899	
	Yakson touch	33	8.39	0.761	
	Total	99	8.27	0.806	
Gestation age (weeks)	Control	33	35.45	0.66	0.84
	Comestible glucose	33	35.51	0.62	
	Yakson touch	33	35.54	0.67	
	Total	99	35.50	0.64	
Age (days)	Control	33	8.33	4.013	0.920
	Comestible glucose	33	8.73	4.185	
	Yakson touch	33	8.42	4.093	
	Total	99	8.49	4.059	

Table 2. Comparison of pain mean scores based on Neonatal Infant Pain Scale in the three studied groups after phlebotomy

Groups	n	SD±mean NIPS score after phlebotomy	P*
Control	33	0.82±3.61	<0.001
Yakson touch	33	0.74±2.88	
Comestible glucose	33	0.65±2.94	

NIPS: Neonatal Infant Pain Scale

SD: Standard deviation

Table 3. Comparison of the two groups after phlebotomy

Compared groups	P*
Comestible glucose-Yakson touch	1.000
Control-Comestible touch	0.005
Control-Yakson touch	0.001

terms of delivery type and gender by the Chi-square test ($P>0.05$). Since the results of the Kolmogorov-Smirnov test showed that pain score data were not normally distributed, nonparametric tests were used to analyze the data.

According to the statistical test Wilcoxon, the mean scores of pain severity before phlebotomy in the three groups had no significant difference, and all the three groups were reported with a score of zero. However, the mean scores of pain severity in the infants after phlebotomy had a significant difference ($P<0.001$). (Table 2).

The results of the DUNN test indicated that there was no significant difference between the two experimental groups in terms of mean pain score after phlebotomy ($P=1.00$). However, in the comparisons of Yakson touch group with the control group ($P=0.001$) and oral glucose group with control group ($P=0.005$), the difference was significant (Table 3).

Discussion

The present study explored the effect of Yakson touch and oral glucose on phlebotomy pain severity due to the heel prick test. As the findings of the study indicated, the mean scores before phlebotomy were not significantly different in the three groups, which was expected. In addition, the results indicated that there was no pain-inflicting factor before phlebotomy. In the present study, Yakson touch and glucose were able to significantly reduce phlebotomy pain in comparison with the control group, indicating that both methods are effective in pain reduction. The results are consistent with the results of previous studies in this regard.

Kim et al. (2008) conducted a study on 99 neonates with the aim of exploring the effect of Yakson touch and non-nutritive sucking on the pain reduction of heel stick in three hospitals in South Korea. The results indicated that there was a significant difference between the control group

and Yakson touch and non-nutritive sucking groups in terms of pain score. In the aforementioned study, it was indicated that Yakson touch similar to non-nutritive sucking is effective in pain reduction in term infants. (30).

Shiva Rafati et al. (2014) conducted a study on 136 term infants with the aim of exploring the effect of massage on the physiological pain responses of venipuncture. The results of the aforementioned study indicated that massage in addition to reducing pain positively affects the reduction of some pain physiological responses due to venipuncture in infants. One of the differences between the aforementioned study with our study is the type of massage (38).

Zohreh Abbasi et al. (2007) explored the effect of massage on the intensity of pain caused by vaccination in 60 term and healthy infants. The massage was done using effleurage method (i.e., palm sliding on legs) and petrissage method (i.e., kneading the muscle of infant) for 30 min by the mother. The results of the aforementioned study indicated that massage reduced the pain of vaccination. Despite the type of massage that is different with the message type in the present study, as massage is one of the easiest complementary medicines that does not require equipment, it can be used as a pain-reducing method in infants and for the improvement of mother-child relationship (39).

Herrington and Chiodo (2014) conducted a study with the aim of exploring the effectiveness of Gentle Human Touch (GHT) in reducing pain in preterm infants. The results of the aforementioned study indicated that this type of touch can reduce the pain response of preterm infant during blood collection. In the aforementioned study, the type of touch and time of pain intensity measurement were different from those in our study; however, the overall result of that study indicating the pain-relieving effect of touch is consistent with the findings of our study (40).

BahmanBijari et al. (2012) conducted a study with the aim of determining the effect of GHT on behavioral reactions in preterm infants. The results of the aforementioned study indicated that both Yakson touch and GHT can reduce stress and

improve sleep quality and arterial oxygen. However, there was no difference between the two types of touches. The results of the aforementioned study can help to understand the positive effects of Yakson touch in addition to pain relief in infants (29).

It can be said that Yakson touch in addition to its touch effect that exists in every massage can increase vital energy and reduce stress or its resulted behaviors more by its gentle pressure (41). It is suggested that more studies should be performed to determine the most appropriate type and amount of touch for fulfilling comfort and reducing stress in infants in different conditions (42).

In the present study, it was revealed that oral glucose reduced phlebotomy pain in preterm infants that can support the results of previous studies indicating the positive effect of oral glucose on pain reduction. These studies were conducted by Fatemeh Eghbalian and Zohreh Shalchi (2014) whose aim was comparing the analgesic effects of glucose, mother lactation, acetaminophen, and sterile water on reducing infant's pain. The results of this study that was conducted on 128 term infants indicated that oral glucose can be effective as much as oral acetaminophen in pain reduction in infants (43).

Also, Khodam and Sabzi (2010) conducted a study on 120 term infants with the aim of determining the effectiveness of oral sucrose on pain severity in term newborns who underwent the heel prick. Crying, Requires O₂ for oxygen saturation (SpO₂) above 95, Increased vital signs, Expression, and Sleeplessness (CRIES) as a neonatal pain measurement was used for scoring the severity of infant pain in the aforementioned study. In addition, the aforementioned study pointed out the positive effect of oral sucrose on the reduction of pain in newborns who underwent the heel prick (44).

Nouri Shad Kamet et al. (2005) conducted a study with the aim of comparing topical spray cream with oral glucose to reduce pain during painful procedures. The study was conducted on 220 icteric term infants that needed blood collection. In the aforementioned study, it was revealed that oral glucose is more effective than topical spray cream in reducing the pain of blood collection, and the infants receiving oral glucose had a lower pain score (45). It seems that the study population, as well as variables and pain measurement methods, are different in different studies. Therefore, it is necessary to do pain control using non-pharmacological methods, such as oral glucose

and massage, with controlling the aforementioned variables to be able to have a definite conclusion.

It is suggested to explore the effect of Yakson touch on pain reduction in infants by measuring physiological indices or using other tools and compare the results with other non-pharmacological methods of pain reduction. Also, other studies can explore the effect of Yakson touch by mother on mother-infant attachment behavior.

The limitation of the present study was controlling disturbing environmental factors, such as light and noise during the intervention; however, despite that, the effect of Yakson touch and oral glucose on the reduction of phlebotomy pain in preterm infants was determined. One of the strengths of this study was blinding the pain assessor to the groups in the study.

Conclusion

Considering the results of the present study, it can be said that Yakson touch reduces phlebotomy pain as much as oral glucose. In addition, this touch is easy and safe and does not need equipment. It can be used as a non-pharmacological method for pain reduction in infants.

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Conflicts of interests

The authors declare that there is no conflict of interest.

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