

## The Effect of Abdominal Touch on Nutritional Tolerance in Premature Infants: A Randomized Controlled Clinical Trail

Soheila Badini Pourazar<sup>1</sup>, \*Azam Shirinabadi Farahani<sup>2</sup>, Alireza Ghahri Sarabi<sup>3</sup>, Mohamad Amin Pourhoseingholi<sup>4</sup>, Kamran Dehghan<sup>5</sup>

<sup>1</sup>Master of Nursing, Neonatal intensive Care, School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran. <sup>2</sup>Ph.D in Nursing, Instructor, School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran. <sup>3</sup>Master of Nursing, Instructor, School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran. <sup>4</sup>Ph.D in Biostatistics, Associate Professor, Gastroenterology and Liver Diseases Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran. <sup>5</sup>Neonatologist, Assistant professor, Urmia University of Medical Sciences, Urmia, Iran.

### Abstract

#### Background

The most common cause of death during neonatal period is prematurity. Nutritional tolerance is very important in this period. If during this period the problems of feeding the preterm infant are not resolved, chronic disorder occurs in normal growth.

#### Materials and Methods

In this randomized controlled clinical trial we selected 60 preterm infants in the neonatal intensive care unit of Motahhari Hospital in Urmia, Iran, and randomly assigned to control and intervention groups. The infants were touched using Field technique by olive oil in two steps in the morning and evening, with a time of 15 minutes by first researcher. Nutritional tolerance was evaluated using the "Daily Observation Chart" and by gavage milk volume, abdominal circumference, the frequency of defecations and gastric residual volume. The data were collected during 4 consecutive days and the results were compared on the fourth day, with the first day. Data were analyzed using SPSS software version 17.0.

#### Results

According to the results, the abdominal circumference after touch was less in the intervention group ( $1.77 \pm 1.38$ ) compared to the control group ( $1.43 \pm 1.22$ ) ( $p < 0.05$ ). However, the frequency of defecations ( $1.03 \pm 0.61$ ) and the volume of the gavage milk ( $9.83 \pm 2.68$ ) was increased ( $p < 0.05$ ), but there was no significant difference between the frequency of vomiting in fourth day group.

#### Conclusion

According the results, touching in premature infants using Field technique in two steps in the morning and evening, with a time of 15 minutes can improve nutritional tolerance of premature infants.

**Key Words:** Infant, Nutritional Status, Premature, Tolerance, Touch.

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#### \*Corresponding Author:

Azam Shirinabadi Farahani, School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Email: farahani1381@yahoo.com

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## 1- INTRODUCTION

The most common cause of death during neonatal period is prematurity, and is inversely related to fetal age and birth weight (1). According to the World Health Organization (WHO), in 2012, one out ten neonates annually is born prematurely, and approximately 40% of neonatal mortality is happen in the first 28 days of life in the world (2). In other words, the main causes of infant mortality are prematurity, low birth weight, infections and asphyxia at birth. One of the basic problems in prematurity is weakness in the necessary skills to start breastfeeding that is essential for physiological stability and proper weight gain of the neonates for discharge (2, 3). About 32-34 weeks after delivery, the ability to swallow and suckle is coordinated; often due to lack of gastrointestinal tract development and high gastric residual volume make nutritional problems (4, 5). If the nutritional problems of the preterm infants are not resolved, it causes a chronic growth disorder (6).

Nurses are the most important member of the care team in treating the nutritional problems of neonates (7). On the other hand, given that the mission of nurses is to provide holistic care, a variety of care methods should be used to meet the needs of patients (8). Touching is one of the 23 methods proposed in complementary medicine which the patient is considered as a whole and is not focused on a particular disorder or disease (9). The benefits of touching include improving the state of neuronal development to provide calm and Calm and confident. Silent touching, silent speaking or non-verbal communication is a physiological sensation that results in sensory receptors in the skin and then its analysis in the brain (10). The evidence of touching effect on the relaxation and reduction of neonatal pain has been approved (11). By touching, the parasympathetic nerve of the intestines is stimulated, food intake increases and

insulin secretion occurs, albeit other factors can have the same effect such as acupuncture (12, 13). In the study of Choi et al., it was found that in intervention group who received touching with the Field method, increased chest circumference, height, physical growth, intestinal movements, and decreased gastric residual volume were more than the other group (9). In a randomized controlled clinical trial, neonates in the first group received massage without using oil for 10 days and 15 minutes a day using their mother's oils using olive oil and second-generation neonates and in the third group of infants, and there was a significant difference between the mean changes in the respiratory rate of the massage group with olive oil and the control group (14).

In another study conducted in Iran, the abdominal massage affected the preterm infants' feeding, tolerance criteria and significantly reduced the gastric residual volume, the abdominal circumference, and the frequency of vomiting episodes (15). Other clinical trial in Iran showed that the mean of changes of respiratory rate, heart rate and oxygen saturation level in the abdominal massage group had a significant statistical difference with the control group (16). Considering the limited ability of premature infants to consume and absorb food, providing adequate calories for the better growth of these infants are an important part of nursing activities in this group. For this purpose, oral-gastrointestinal tubes are used. In preterm infants, orogastric tube (OGT) is often used instead of nasogastric tube (NGT) (17). According to the results of the studies, placing the preterm infants in inappropriate position will result in nutritional tolerance and prolonged hospitalization in the neonatal intensive care units (NICUs), while the right lateral position and head up lead to reduction in the frequency of reflux, because the

anatomy and physiology of the human body in this position strengthens the muscular structure of the lower stomach sphincter, which allows its contents to be pushed to the fundus of the stomach (18, 19). Therefore, considering the limited number of studies carried out to investigate the effect of abdominal touch on nutritional tolerance in preterm infants in Iran, and on the other hand, the importance of touch in preterm infants' nutritional tolerance, the present study was aimed to investigate the effect of abdominal touch on nutritional tolerance in preterm infants in Iran.

## 2- MATERIALS AND METHODS

### 2-1. Study design and population

This study was a randomized controlled clinical trial conducted for 4 days in 2017 on 60 preterm infants in the neonatal intensive care unit of Motahhari Hospital in Urmia city, West Azerbaijan province, North West of Iran. The objective-oriented method was used for sampling, and then randomly divided into control and intervention groups using cards in the box, so that card A was considered for neonates with touching and card B for neonates without touching.

The samples of this study, according to the sample size formula:

$$n = \frac{(Z_{\alpha} + Z_{\beta})^2 \sigma^2}{\epsilon^2}$$

Consisted of 63 neonates and the effect size (mean difference between the control group and the intervention group after the intervention to standard deviation) according to the results of previous studies (4) was 0.72. Three neonates (boot heart or right ventricular hypertrophy, imperforate anus) were excluded and the total volume of 60 neonates was considered.

### 2-2. Methods

The neonate was weighed before 9 o'clock A.M; the abdominal circumference was also measured. At 9 o'clock A.M and 9 o'clock P.M., nutrition was started using OGT, based on the standard protocol (20). One hour later, the abdomen was touched after washing hands, warming and lubricate with olive oil (manufactured by Etkafactory, Iran) on the neonate's body for 15 minutes by researcher (which was familiar with the touch technique) (**Figure.1**). Then the neonate was placed on the right lateral and head up position. The data were collected during 4 consecutive days and the results were compared on the fourth day, with the first day.

### 2-3. Measuring tools: validity and reliability

The validity of "Neonatal demographic characteristics questionnaire" and "Daily observation chart" were confirmed by experts, including 5 faculty members of the School of Nursing and Midwifery and 3 neonatal specialists. In this research, standard measuring tape and 5 ml syringes were used (manufactured by Atlas factory, Iran). In the use of the syringe, the syringe piston was pushed back and forth in the inner duct several times. The baby's touch was done using Field technique for 5 consecutive days (20). The following tools were used in this study:

- Neonatal Demographic Characteristics Questionnaire" includes age of neonate, gender and type of nutrition.
- "Daily observation chart" to record information on the gavage volume, the size of abdominal circumference before and after feeding, the frequency of vomiting, the frequency of defecations, the gastric residual volume one hour after touching.

- "Syringe" to measure the gavage milk volume and the gastric residual volume.
- "Measuring tape" for measuring abdominal circumference (Measurement error = 0.5 mm).



**Fig1:** The baby massage and touch using Field technique.

#### **2-4. Intervention**

The infants in intervention group were in two steps in the morning and evening, with a time of 15 minutes. Infants in the intervention group received only routine care.

#### **2-5. Ethical consideration**

This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Science (Tehran, Iran) with code IR.SBMU.PHNM.1395.439, clinical trial code of IRCT.2016102430474N1 and the objectives of the study were explained to all participants and all of them accepted to participate and were assured of the confidentiality of their individual information as well as the voluntary nature of participating in the study, in such a way that they were free to leave study.

#### **2-6. Inclusion and exclusion criteria**

Inclusion criteria were included preterm infants in 32-28 weeks, lack of congenital anomalies, lack of heart, respiratory or digestive disease, no need for surgery, physiological instability, weight between

1,000-1,800 gr, inadequate oral intake, lack of inadequate swallowing. After receiving informed consent from the neonate parents, one of the cards was randomly taken and the group was identified and the next neonate was placed in a group other than the previous one. Exclusion criteria included any new changes in the condition of neonate that caused to withhold oral intake of food and fluids or changes that lead to the use of mechanical ventilation or continuous positive airway pressure (CPAP).

#### **2-7. Data Analyses**

Kolmogorov-Smirnov test was used to test the distribution of data. To compare variables before and after intervention, independent t-test was used in both groups. Independent t-test and paired t-test were used to compare the effect of touching between the first day and the last day of the study on the nutritional tolerance before and after the intervention. Also, Fisher's exact test was used to show the dependence of vomiting in neonates between two groups because of low

sample in this category and the significance level was 0.05.

### 3-RESULTS

In this study, 56.7% of the neonates were girl and 43.3% were boy. The mean age and gestational age of mothers in the intervention group was  $27.58 \pm 3.30$  years and  $30.71 \pm 1.53$  weeks, respectively; the birth weight was  $1,485.33 \pm 171.42$  gr. In the control group (without abdominal touch), the mean age and gestational age of mothers were  $26.27 \pm 3.32$  years and  $30.53 \pm 1.55$  weeks respectively and the birth weight was  $1428.67 \pm 259.29$  gr. Statistical analysis indicated that there was no significant difference between the intervention and control groups in demographic variables ( $P > 0.05$ ) and two groups were matched (**Table.1**).

Regarding the effect of touch on nutrition tolerance, four variables were investigated as variables indicating nutrition tolerance including the gavage milk volume, abdominal circumference, the frequency of defecations and gastric residual volume (4, 17-19). At first, the changes of each variable in one group and then changes of variables between two groups were investigated. According to **Table.2**, paired t-test showed that there was no significant difference between two groups about the gastric residual volume before every step of the gavage in the intervention group ( $P > 0.05$ ), but the mean volume of gavage milk and the frequency of defecations on

the fourth day was significantly more than before intervention ( $P < 0.05$ ), and the mean abdominal circumference after nutrition in the fourth day was significantly reduced compared to before intervention ( $P < 0.05$ ). In the control group, there was no significant difference between the frequency of defecations and the gastric residual volume before and after the two periods ( $P > 0.05$ ). However, the mean volume of gavage milk and abdominal circumference after nutrition were significantly higher than before nutrition in the fourth day ( $P < 0.05$ ).

According to **Table.3**, independent t-test showed that there were no significant differences between two groups before and after intervention about variables indicating nutritional tolerance ( $P > 0.05$ ). In the fourth day, the mean volume of gavage milk and the gastric residual volume before every step of the gavage did not show any significant difference between the two groups ( $P > 0.05$ ), but the mean of abdominal circumference after nutrition was significantly less in the intervention group compared to the control group before nutrition ( $P < 0.05$ ) and the mean frequency of defecations in the intervention group were significantly more than the control group ( $P < 0.05$ ). Also, Fisher's exact test showed that the frequency of vomiting in neonates was not significantly different between two groups ( $P > 0.05$ ) (**Figure.2**).

**Table-1:** The mean age of mother, gestational age, birth weight as well as 1 and 5 minute neonatal Apgar score in two groups

Variables	Control		Intervention		Independent t test	
	Mean	SD	Mean	SD	P-value	t-test
Age of mother (year)	26.27	3.32	27.58	3.30	0.42	0.81
Gestational age (week)	30.53	1.55	30.71	1.53	0.66	0.45
Birth weight (gr)	1428.67	255.29	1485.43	171.42	0.32	1.009
Apgar in 1 minute	6.42	1.07	6.62	1.12	0.51	0.66
Apgar in 5 minute	7.73	0.91	7.62	1.18	0.68	0.41

SD: Standard Deviation.

**Table-2:** The comparison of mean variables indicating nutritional tolerance before intervention and the fourth day of intervention in each intervention and control group

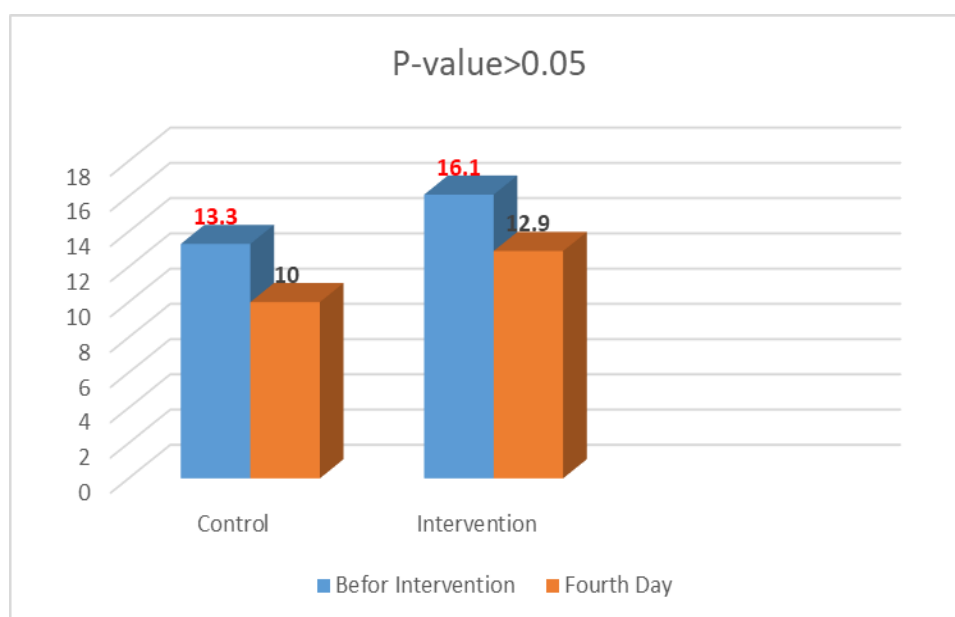
Group	Variables	Fourth day		Before intervention		Paired t-test	
		Mean	SD	Mean	SD	P-value	T-test
Intervention	Volume of gavage milk	9.10	3.82	3.71	1.83	<0.001	11.46
	Abdominal circumference	-3.74	3.42	1.77	1.38	<0.001	8.08
	Frequency of defecations	1.55	0.96	1.10	0.87	0.02	2.37
	Gastric residual volume	1.89	3.11	2.10	2.30	0.59	0.54
Control	Volume of gavage milk	9.83	2.68	4.30	1.90	<0.001	13.63
	Abdominal circumference	3.60	2.28	1.43	1.22	0.002	3.40
	Frequency of defecations	1.03	0.61	0.87	0.57	0.26	1.15
	Gastric residual volume	1.48	2.04	1.55	1.99	0.31	1.03

SD: Standard Deviation.

**Table-3:** Comparison of mean variables indicating nutritional tolerance before intervention and the fourth day of intervention between intervention and control groups

Group	Variables	Control		Intervention		Independent t-test	
		Mean	SD	Mean	SD	P- value	t-test
Before intervention	Volume of gavage milk	4.30	1.90	4.71	1.83	0.22	1.24
	Abdominal circumference	1.43	1.92	1.77	1.38	0.43	0.80
	Frequency of defecations	1.87	0.57	1.10	0.87	0.23	1.22
	Gastric residual volume	1.55	1.99	2.10	2.30	0.32	1
Fourth day	Volume of gavage milk	9.83	2.68	6.10	3.82	0.39	0.87
	Abdominal circumference	3.60	2.28	- 2.74	3.42	<0.001	9.83
	Frequency of defecations	1.03	0.61	1.55	0.96	0.02	2.50
	Gastric residual volume	1.48	2.04	1.89	3.11	0.55	0.60

SD: Standard Deviation.



**Fig.2:** The frequency of vomiting in neonates before intervention and fourth day in intervention and control group.

#### 4- DISCUSSION

The aim of this study was to evaluate the effect of touch on the nutritional intolerance in premature neonates with right lateral and head up position. Sleeping position to the right lateral and head up position is very suitable for tolerating feeding in preterm infants. Since this position is considered appropriate to tolerate feeding in neonates (18). There are some other techniques to effect on the infants' nutrition such as Kangaroo care model (21). Also, according to Chen et al., the gastric residual volume in this position was reduced and neonates have more weight in situation (22). Another study entitled "The effect of body position on the gastric residual volume in preterm infants" revealed that residual volume decreased one and two hours after gavage in the prone and right lateral position (23).

The present study assumes that the position of the neonate improves the nutritional status in the right lateral and head up position, this variable has been kept constant in all neonates. In another randomized controlled clinical trial conducted by Seyyedrasooli et al., abdominal massage in the intervention group with the "I Love You" method and non-nutritive sucking in the second intervention through sucking a pacifier were performed twice in day for 15 minutes. The control group also received typical unit care. Changes of respiratory rate, heart rate and oxygen saturation level in the abdominal massage group had a significant statistical difference with each of the control and non-nutritive sucking groups (17), so that it can be noted that one of the effective technique in Field method and other models such as "I love you" can be used to enhance infants' nutritional tolerance. The present study showed that there was no significant difference in the residual volume after touch in the intervention group compared to the control group. The results of other studies showed

that the abdominal touching had a positive effect on the reduction of the gastric residual volume (18). Also, a study conducted by Diego and colleagues showed that the gastric residual volume decreased by one and two hours after feeding in the hugging position and abdominal massage. The results of these studies are in contrast to the findings of the current research, while the tactile action stimulates the outer fibers of the vague leading to stimulation of the digestive system and increased gastric movements. As a result, gastric residual volume decreased (24). Stimulation of the vague increases blood flow to the intestine and reduces the abdominal circumference and the gastric residual volume (25).

In the study of Shaeri et al., one hour after the feeding, abdominal massage twice a day for 15 minutes in a 5-day period was the intervention. The abdominal massage affected the preterm infants' feeding-tolerance and reduced the gastric residual volume, the abdominal circumference, and the frequency of vomiting episodes and significantly increased the frequency of defecation in the intervention group, as compared with the control group (15), which was consistent with our study. In this study, after touching, the abdominal circumference in the intervention group was lower than the control group. The study of Diego et al. (2005) showed that the abdominal touch increases the stimulation of the vague, in the stomach and intestine and thus increases the circulation of blood. This reduces abdominal circumference and the gastric residual volume. Therapeutic touch is one of the non-invasive interventions that makes calming, tolerating nutrition and better (24). However, studies have shown "The effect of massage with sesame oil on anthropometric patterns of term neonates" showed that touching had no effect on the size of abdominal circumference (26). The most important warning signs of a possible

nutritional problem in preterm infants are gastric residual volume and abdominal distension (18, 22). Evaluation of the warning signs of possible complications of intestinal nutrition including the gastric residual volume and abdominal distension, are the most commonly suspected symptom in preterm infants (27). The results showed that in this study, the frequency of defecations was increased in the intervention groups after touching. The results of other studies on the effect of touch on preterm infants have shown that after the touch, the bowel movements have increased and in result the number of stools has also increased (18, 28-30).

The frequency of vomiting after touch in the intervention and control group did not change. In the study of Diego et al. (2005), the effects of touch on gastric vagus motility and weight gain in infants were investigated. The results showed that the touch increased the activity of the vagal nerve, which led to weight gain. In justifying this finding, after touching, gastric motility increased and absorption of food was improved, so the frequency and volume of vomiting decreased. This study was inconsistent with the present study (24). In another study in Iran and on the preterm infant, the results showed that the abdominal touch leads to a reduction in the frequency of vomiting (31). As a result, the findings of these studies contradicted the results of current study. This discrepancy is probably due to the lower number and frequency of touches on preterm infants in the current study. In current study the results showed that the volume of gavage milk increased in both control and intervention groups. This finding was consistent with other studies (4, 20, 24, 32).

#### **4-1. Limitations of the study**

One of the limitations of this study was the unstable physiological status of the preterm infant, which was out of researcher's control. It is suggested that

further studies be done about the effect of touching on how to tolerance nutrition in different situations in neonatal intensive care units.

#### **5- CONCLUSION**

The results of this study showed that nutritional tolerance has been improved in preterm infants by creating a proper position after feeding and performing non-invasive touch which was considered as an important issue in caregivers and parental concerns. In summary, touching in premature infants using Field technique in two steps in the morning and evening, with a time of 15 minutes can improve their nutritional tolerance. Nutritional tolerance leads to improved health in preterm infants.

**6- CONFLICT OF INTEREST:** None.

#### **7-ACKNOWLEDGMENTS**

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