

Effects of Abdominal Massage on the Weight Gain of Preterm Infants Hospitalized in Selected Hospitals of Isfahan, Iran: A Randomized Controlled Clinical Trial

Mahin Shaeri¹, Amir-Mohammad Armanian², Saeid Amini Rarani³, Mahboubeh Valiani⁴,
*Ahmad Ghadami⁵

¹MSc. in Neonatal Intensive Care Nursing, Clinical supervisor, New Pasteur Hospital, Mashhad, Iran.

²Associate Professor of Neonatology, Child Growth and Development Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. ³MSc. in Nursing, Hojjatieh Hospital, Head Nurse of Operating Room, Isfahan, Iran. ⁴MSc. in Midwifery and Reproductive Health, Nursing and Midwifery Care Research Center, Department of Midwifery and Reproductive Health, Faculty of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran. ⁵Assistant Professor, Ph.D. in Nursing, Ulcer Repair Research Center, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran.

Abstract

Background: Birth weight is one of the decisive factors in infant vulnerability and mortality. The impact of a full-body massage on the weight gain of preterm infants has been taken into account. Nevertheless, very few studies have been conducted on effects of abdominal massage. Hence, the current study was carried out to explore effects of abdominal massage on the weight gain of preterm infants hospitalized in neonatal intensive care units.

Materials and Methods: This study was a single-blind randomized controlled clinical trial, conducted on 64 preterm infants hospitalized in neonatal intensive care units in selected hospitals of Isfahan. They were randomly categorized into two groups, namely control and intervention. The pre-feeding weight of the infants in the groups was recorded daily. They were fed using an orogastric tube every two hours. One hour after the feeding, a researcher (with a master's degree in Neonatal Intensive Care Nursing) gave abdominal massage to the infants in the intervention group twice a day, at 2.00 p.m. and 8.00 a.m., for 15 minutes, during a five-day period. However, the control group received the routine care in the unit. Data were analyzed using the SPSS software version 23.0, and analytical as well as descriptive statistical methods.

Results: Regarding their gender, 38 infants (59.3%) were male; the mean and standard deviation (SD) of weight gain during five days were more in the intervention group (1480.76±31.29) than in the control group (1365.83±41.93). This difference was statistically significant ($p < 0.05$).

Conclusion

According to the results of the present study, abdominal massage seems to improve weight gain in preterm infants and could be substituted for a full-body massage.

Key Words: Abdominal Massage, Iran, Preterm Infants, Weight Gain.

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*Corresponding Author:

Ahmad Ghadami, Assistant Professor, Ph.D. in Nursing; Ulcer Repair Research Center, Department of Operating Room, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Hezarjerib Street, Isfahan, Iran

Email: ghadami@nm.mui.ac.ir

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1- INTRODUCTION

The neonatal period is an extremely vulnerable stage for an infant. Numerous physiological adaptations to extra uterine life occur during this period. The mortality rate in the first year of life cannot be compared with any rate at other stages up until the seventh decade of life (1). Approximately 14.9 million births are preterm worldwide per year (2). Several studies indicate that the prevalence of preterm delivery in Iran ranges between 1.3 and 11.9 % (3). Preterm birth includes 5 to 18% of pregnancies and is the primary cause of infant mortality (4). Although the health care system has developed, the mortality rate is still alarming among infants with very low birth weight and preterm infants (5). Definitely, infants are among vulnerable people in the community. Since 20-30% of them suffer from low birth weight, they remain vulnerable to infections and diseases (6).

Hence, it could be said that birth weight is one of the major factors explaining infant vulnerability; moreover, it is a determining factor in infant mortality. In fact, the lower birth weight is, the higher infant mortality will be (7). The growth and development of preterm infants are of great significance. Furthermore, weight is viewed as the most important and sensitive indicator for the growth and development of infants. Undeniably, one of the ways to monitor health is to measure weight. The improvement of healthcare methods among infants with low birth weight leads to a reduction in not only neonatal, childhood, and adulthood complications but also healthcare costs (8). Since infant weight gain is the main criterion for hospital discharge, numerous interventions have been designed to maximize the weight gain of preterm infants. One of the interventions is massage therapy (9). There are studies which have explored positive effects of a full-body massage on the weight gain of preterm infants (16-18);

however, there are fears that the infant will be manipulated a lot or the massage therapist will knock or dislodge the medical equipment attached to the infant during a full-body massage. Furthermore, the digestive system is the target organ while giving the infant a massage, which attempts to improve its function. Nevertheless, not many studies have been carried out on effects of abdominal massage. Hence, the present study was conducted to investigate effects of abdominal massage on the weight gain of preterm infants hospitalized in selected hospitals in Isfahan, Iran.

2- MATERIALS AND METHODS

2-1. Study design and population

This study is a single-blind randomized controlled clinical trial and the person who conducted the statistical analysis was unaware of how the groups were set up. It has been registered on the website of the Iranian Registry of Clinical Trials and the registration code is IRCT2016072723216N3. The research population consisted of all preterm infants who had been hospitalized in the neonatal intensive care units in Shahid Beheshti Hospital and the Al-Zahra Hospital, Isfahan city, Iran.

2-2. Methods

The following equation was used for determining the sample size:

$$n = \frac{(Z_1 + Z_2)^2 (2s)^2}{d^2}$$

In this equation, n as sample size = 64 ($n=32$ people for each group); Z_1 as 95% confidence level = 1.96; Z_2 as 80% test power = 0.84; s as the estimate of standard deviation for weight gain in each group = 7.0; and d as the least mean difference between the two groups with respect to each variable, showing a significant difference. Totally, 64 preterm

infants, 29-33 weeks old, who met the inclusion criteria, were included in the present study. They were randomly categorized into two groups, namely control and intervention.

2-3. Measuring tools: Validity and reliability

The data collection tool was a questionnaire comprising demographic information and a checklist for recording daily data. To assess the content validity of the questionnaire, it was submitted to 10 faculty members of the School of Nursing and Midwifery. After necessary modifications made to the questionnaire, it was used in the study. The reliability of the questionnaire was determined using the test-retest method. The correlation coefficient was 0.85.

2-4. Intervention

A statistician was consulted and 64 preterm infants between 29-33 weeks of age were selected and randomly assigned to the control and intervention groups. They were weighed using a Seca 374 digital baby scale (Germany) with a one-kilogram calibration weight and sensitivity error of 5 gr. Their average weight without clothing was measured and recorded before and after the study. The control group received the routine care in the unit. So did the intervention group. However, when the infants in the intervention group were awake and calm and it was one hour after a feeding (8), a researcher gave them abdominal massage in a supine position twice a day, at 2.00 p.m. and 8.00 a.m. (when the unit was unfrequented), for 15 minutes (11), during a five-day period (12). After having attended a training course, the researcher had earned the Certificate in Massage Therapy. The massage was given by the researcher in the presence of a pediatrician in the neonatal intensive care unit. Before the massage, for reducing friction, the researcher applied a few drops of olive oil onto the hands and,

with pressure a little more than a stroke, gave abdominal massage gently following the below instructions:

1. To begin with, hold your hand in a way that the edge of your little finger can move like a paddle across the infant's abdomen.
2. Downward with one hand and then the other one in a paddle-wheel-like motion.
3. In a circular, clockwise motion, massage the infant's abdomen with your fingertips.
4. Do the "I Love U" stroke as follows: Trace the letter I down the infant's left side. Afterwards, trace an inverted L, stroking across the abdomen along the base of the ribs from right to left and down. Trace an inverted U, stroking from low on the infant's right side, up and around the navel, and down the left side.
5. Walk your fingers around the navel clockwise.
6. Hold the knees and feet together and then press the knees up toward the abdomen in a gentle way. Rotate the infant's hips around to the right a few times.
7. Place your hand on the abdomen horizontally and rock your hand from side to side a few times. Remember not to massage the abdomen if the cord has not healed completely (12).

The massage was stopped and necessary steps were taken under the supervision of a pediatrician when the following signs were observed: a skin color change, vomiting, apnea, rapid respiration, muscle contraction, increased or reduced heart rate, and decreased hemoglobin saturation.

2-5. Ethical considerations

At the start of the study, the parents were briefed on the objectives of the research and written informed consent was obtained

from them. It was approved by the Ethics Committee of Isfahan University of Medical Sciences (ID- code: Ir.mui.rec.1395.3.001).

2-6. Inclusion and exclusion criteria

The inclusion criteria in the present study included infants who had a gestational age between 28-32 weeks; had a birth weight between 1,000-1,800 gr; were fed exclusively with breast milk; had a written order from the doctor to be fed with a minimum of 20 cc/kg of milk daily; had no intestinal obstruction, abdominal surgery, or contraindication to abdominal massage; were fed using the orogastric tube; and suffered from no major congenital malformations such as congenital heart disease, digestive anomalies, hypoxic injury, respiratory failure (which makes the infant use a mechanical ventilator), previous or current history of necrotizing enterocolitis, confirmed or suspected sepsis, or cerebral hemorrhage. The following infants were to be excluded from the study: infants whose mothers opted out of the study, who died or were discharged before the end of the intervention, and those who became unwell during the intervention.

2-7. Data analysis

The SPSS software version 23.0, and descriptive as well as analytical statistical methods including the paired t-test, analysis of variance (ANOVA) and covariance (ANACOVA), t-test, Chi-square test, Mann-Whitney U test, and Wilcoxon test were used to analyze the data. Data analysis was conducted according to a pre-established analysis plan. Proportions were compared using a chi-square test with a continuity correction or Fisher's exact test when appropriate. The means of weight gain before and after the intervention in the two groups were compared using the paired t-test, ANOVA, ANACOVA, t-test, Mann-Whitney U test, and Wilcoxon tests when necessary.

3- RESULTS

The present study was conducted on 64 preterm infants, who were randomly categorized into two 32-member groups, namely control and intervention. Of the infants, 24 (37.5%) were in Al-Zahra Hospital, and 40 (62.5%) were in Shahid Beheshti Hospital, Isfahan, Iran. Regarding their gender, 26 infants (40.7%) were female, and 38 infants (59.3%) were male. One subject was excluded from the study due to the diagnosis of necrotizing enterocolitis. According to the statistical results, there was no significant difference between the two groups with respect to the variables, namely gender, oxygen therapy, type of delivery, age at the initial breast-milk feeding, birth weight, maternal age, Apgar score, and weight at the start of the study (p -value > 0.05) (**Table.1**).

The results demonstrated that the mean and standard deviation (SD) of weight in the intervention group before and after the intervention were 1450.68 ± 32.18 and 1480.76 ± 31.29 gr, respectively. According to the results, there was a statistically significant difference between the mean weight before and that after abdominal massage in the intervention group ($p < 0.05$). Furthermore, the mean and SD of weight in the control group before and after the intervention were 1360.17 ± 43.89 and 1365.83 ± 41.93 gr, respectively. The results showed that there was no statistically significant difference between the mean weight before and that after abdominal massage in the control group ($p > 0.05$). **Table.2** shows the results of the comparison of mean weight changes between the two groups after the intervention (**Figure.1**). Regarding the comparison of mean weight changes between the two groups after the intervention, the independent t-test revealed a significant difference between the groups ($p < 0.05$).

Table-1: The mean baseline characteristics of the preterm infants in the two groups before the intervention

Variables	Sub-groups	Control (Mean ± SD)	Massage (Mean ± SD)	P-value
Apgar score (minute)	1st min	6±2.00	6.35±1.8	0.56
	5th min	8.79±2.1	8.48±2.2	0.20
Age at the initial breast-milk feeding (week)		13.80±7.2	14.40±7.8	0.79
Birth weight (g)		1445.17±48.11	1481.68±50.51	0.16
Weight at the start of the study (gr)		1360.17±43.89	1450.68±32.18	0.06
Maternal age (year)		29.75±3	29.68±2	0.94
Type of delivery, No. (%)	Caesarean	25 (8.39%)	23 (9.36%)	0.28
	Vaginal	7 (2.10%)	9 (1.13%)	
Oxygen therapy, No. (%)	Yes	21 (34.6%)	17 (27.9%)	0.30
	No	11 (15.4%)	15 (22.1%)	
Gender, No. (%)	Female	14 (21.9%)	12 (18.8%)	0.46
	Male	18 (28.1%)	20 (31.2%)	

P < 0.05 shows that there is a significant difference; SD: Standard deviation.

Table-2: A comparison of mean weight changes between the two groups after the intervention

Group	Weight changes (gr)		P-value
	Mean	SD	
Intervention	1480.76	31.29	0.02
Control	1365.83	41.93	

P < 0.05 shows that there is a significant difference; SD: Standard deviation.

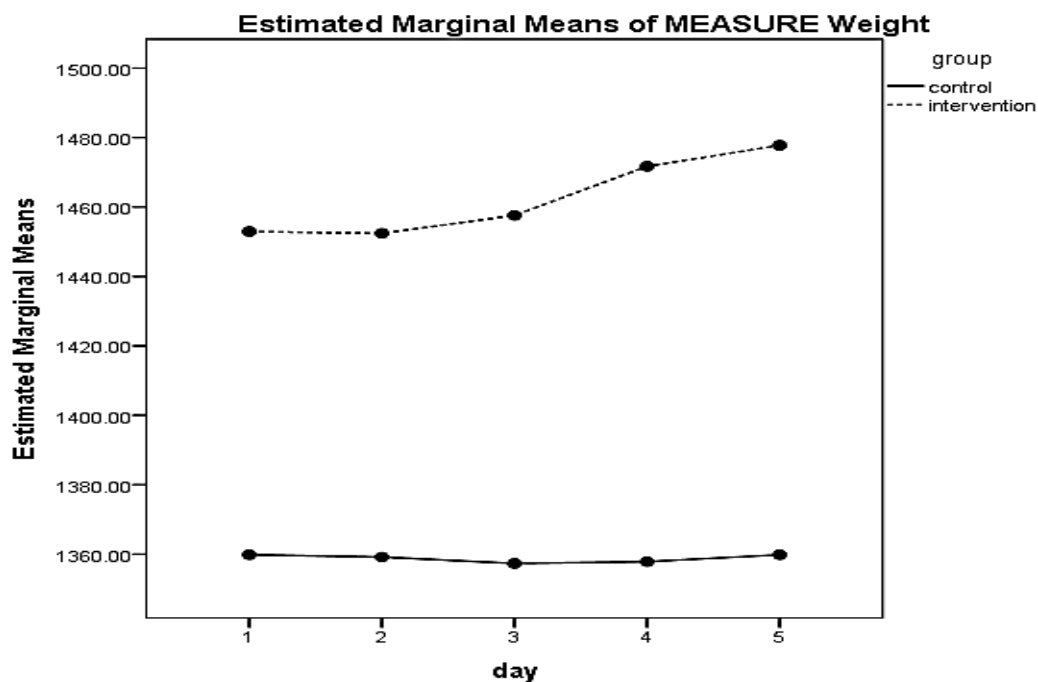


Fig.1: The linear diagram illustrating mean weight changes before and after the intervention in the two groups during the five days.

4- DISCUSSION

The present study was performed to explore effects of abdominal massage on the weight gain of preterm infants. The subjects received abdominal massage for five days, twice a day, and for 15 minutes each time. The study showed that there was a significant increase in the weight of the infants in the massage group, compared with the control group (Figure 1). Low birth weight leaves infants very prone to risks such as cerebral palsy, mental retardation, neurological disabilities, respiratory diseases, sudden infant death syndrome, and complications resulting from hospitalization in intensive care units (13, 14). An increase in body weight minimizes the risk of suffering from these conditions. Thus, it is highly significant to explore effects of methods relevant to the weight gain of infants with low birth weight. Massage is an intervention which contributes to the growth and development of infants, helps to induce relaxation by increasing endorphin secretion, reduces muscle tension, aids the disposal of bodily waste, reduces cortisol secretion, mitigates the risk of temperature drop, and minimizes the risk of infections among infants (15).

Effects of a full-body massage on infant weight gain have been already studied (16-18). However, there are contradictory results in these studies with respect to a full-body massage. In a study by Mohamadzadeh et al., the effectiveness of a full-body massage on preterm infants was evaluated. The results showed that there was a significant increase in the rate of weight gain in the intervention group, compared with the control group (19). In a study by Chen et al., preterm infants received a 15-minute massage three times a day for 10 days. The massage group experienced more daily weight gain (17). Nevertheless, Lee found no significant difference in the weight gain of the two groups after a four-week full-body

massage (20). Modrcin-Talbott et al. showed that there was no significant difference between the intervention and control groups after a full-body massage with respect to the rate of weight gain (21). Definitely, the type of massage, the sample size, and the duration of the intervention have affected these contradictory results. Nevertheless, no study has ever explored effects of abdominal massage on weight gain. Only the positive effect of abdominal massage on feeding tolerance among preterm infants has been investigated. According to results of the study, abdominal massage could significantly reduce the gastric residual volume, the abdominal circumference, and the frequency of vomiting episodes among preterm infants; moreover, abdominal massage could increase the frequency of their defecation significantly (12, 22).

Therefore, abdominal massage can affect the weight gain of preterm infants significantly by improving signs of feeding tolerance. Furthermore, abdominal massage helps infant weight gain by stimulating the parasympathetic nervous system, increasing bowel movements, boosting the food intake, and increasing insulin release (23). The results of the current study indicated that abdominal massage increased weight significantly in the intervention group, compared with the control group. Hence, abdominal massage can be used to improve weight gain and reduce the length of hospital stay.

4-1. Limitations of the study

One of the limitations of the study was that the intervention was short. The other limitation was the low frequency of abdominal massage because the condition of the preterm infants had been taken into account. It is therefore recommended that further studies be conducted on this.

5- CONCLUSION

To sum up, abdominal massage contributes to weight gain in preterm infants. Hence, mothers should be trained in it and, together with the healthcare team, give preterm infants abdominal massage to improve weight gain in them. Since the present study was specifically on the abdomen and there are very few studies in this field, it is recommended that detailed studies be carried out.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGEMENTS

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