



Effect of Abdominal Massage on Gastric Residual Volume and Weight Gain of Premature Infants Admitted in NICU

Mahboobeh Ghasemi M.Sc.¹, Bita Najafian M.D.², Mohammad Hossein Khosravi M.D.³, Mehrandokht Nekavand M.Sc.^{1*}

¹ Department of nursing and midwifery, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran

² Department of Pediatrics, Faculty of Medicine, Baqiyatallah University of Medical Sciences, Tehran, Iran

³ Student Research Committee (SRC), Baqiyatallah University of Medical Sciences, Tehran, Iran

*Corresponding Author: E-mail: m.nekavand@sbiau.ac.ir / Address: Tehran Medical Branch, Islamic Azad University, khaghani st, shariati Ave, Tehran, Iran / Telephone: +982122006660-7

Abstract

Introduction: One of the most important problems of premature infants and main reason of hospitalization in neonatal intensive care unit (NICU) is their low birth weight. They need gavage for feeding which has several side effects. Thus choosing appropriate nutritional interventions in premature infants decreases gavage-related complications and results in lower duration of hospitalization.

Methods: In this clinical trial study premature infants were randomly allocated to two intervention and control groups. Both groups underwent routine care. Intervention group infants received abdominal massage 15 minutes twice a day for five days by a trained physiotherapist using moisturizing lotion based on the method described in previous studies.

Results: Eventually 28 infants (15 male and 13 female) with a mean gestational age of 32.43 ± 1.16 weeks in intervention and 33 ± 0.88 weeks in control group underwent analysis ($p=0.15$). Mean gastric residual volume was 0.71 ± 1.13 ml in intervention and 1.43 ± 1.55 ml in control group prior to intervention ($p=0.2$). It was 1.93 ± 2.43 ml in intervention and 4.71 ± 4.25 ml in control group in the fifth day of intervention ($p=0.04$). Before intervention, mean weight was 1830 ± 330 gr in intervention and 1870 ± 370 gr in control group ($p=0.82$). In the fifth day of intervention mean weight was 1871 ± 323.15 gr in intervention group and 1767 ± 347.24 gr in control group ($p=0.001$).

Conclusion: In conclusion our findings suggest that abdominal massage efficiently decreases gastric residual volume and helps with weight gain in preterm infants.

Keywords:

Abdominal massage;
Gastric residual volume;
Premature infant;
Weight gain

Introduction

Preterm birth consists %9-5 of all births in developing countries and 12.8 % of births in United States. Out of 40 million mortalities in the first 28 days of life, more than one million infantile mortalities are related to

prematurity complications each year (1). Nowadays, significantly increasing number of premature infants is saved due to improvement in neonatal care and this has drawn specialists' attention to growth and development of this population.

One of the most important

problems of premature infants and main reason of hospitalization in neonatal intensive care unit (NICU) is their low birth weight. Previous studies have indicated that low birth weight (LBW) is a determining factor of infantile mortality worldwide (2). Premature infants need special and long-term care for overcoming their growth failure and preventing neurological disorders. During this period, there are a remarkable number of nutritional problems. Infants with gestational ages of less than 34 weeks have higher risks of aspiration because of discrepancies between sucking, swallowing and respiration; so feeding should be through gavage (3). This method has several complications such as vague nerve stimulation and bradycardia, increased respiratory effort, aspiration, perforation of gastrointestinal tract and necrotizing enterocolitis. Oral feeding intolerance in premature infants is a main concern which influences duration of hospitalization. This intolerance is determined by abdominal distension and increased gastric residue which is considered as a visible criteria for gastric depletion (3).

Thus choosing appropriate nutritional interventions in premature infants decreases gavage-related complications and results in lower duration of hospitalization, lower costs and more effective emotional relation between infants and mothers (4). Enteral nutrition intolerance is a major problem in premature infants which leads to higher risks of sepsis because of long-term application of parenteral nutrition (5).

In the last two decades abovementioned problems has made researchers to provide a variety of complementary stimulations for premature infants to help with their development (6). Providing touching stimulations such as massage are among complementary interventions which are

effective on growth and development trend. Massaging infants has been an important part of care in different communities and especially India and it has been evaluated scientifically in recent years (2).

Endearment and touching have important roles in physical and emotional growth of infants. Massage is the best way which not only empowers emotional relation of mother and infant but also helps with relieving colic pains and gastrointestinal system development. It is also considered that massage improves blood circulation and relieves central and peripheral nervous system pains.

Therefore, regarding that a few related studies have been conducted in Iran we aimed to evaluate the effect of abdominal massage on gastric residue in NICU-admitted premature infants.

Results

Eventually 28 infants (15 male and 13 female) with a mean gestational age of 1.16 ± 32.43 weeks in intervention and 0.88 ± 33 weeks in control group underwent analysis ($p=0.15$). Demographic information has been summarized in Table 1. Most of the infants in both intervention (%71.4) and control (%85.7) groups were conceived by cesarean section ($p=0.32$). Prematurity was the most prevalent cause of admission in both intervention (%57.1) and control (%35.7) groups followed by tachypnea and respiratory distress. There was no significant difference between two groups for cause of admission ($p=0.79$). Mean birthweight was 318.22 ± 1892.14 gr in intervention and 379.36 ± 1930.71 gr in control group ($p=0.77$). Mothers had a mean age of 4.86 ± 29.36 years in intervention and 5.61 ± 31.57 years in control group ($p=0.28$). In intervention group %28.6)4) and in control group %42.8)6) had an underlying disease ($p=0.35$).

Variable	Intervention group (N=14)	Control group (N=14)	p Value
Male, N (%)	%64.3)9)	%42.9)6)	0.25
Gestational age, weeks (mean±SD)	1.16±32.43	0.88±33	0.15
Birthweight, gr (mean±SD)	318.22±1892.14	379.36±1930.71	0.77
Height, cm	3.04±43.96	2.39±43.61	0.73
Head circumflex, cm (mean±SD)	2.15±30.57	3.33±30.90	0.76
Abdominal circumflex, cm (mean±SD)	1.62±27.61	2.83±27.18	0.63

Table 1. Demographic information of study individuals

Mother's milk was the most common (%42.9) type of feeding in intervention group; while it was formula (%64.3) in control group ($p=0.06$). Mean gastric residual volume was 1.13 ± 0.71 ml in intervention and 1.55 ± 1.43 ml in control group prior to intervention ($p=0.2$). It was 2.43 ± 1.93 ml in intervention and 4.25 ± 4.71 ml in control group in the fifth day of intervention ($p=0.04$). Changes

in mean gastric residual volume during intervention

has been shown in table 2. Mean frequency of vomiting was 0.27 ± 0.07 times in intervention and no vomiting was recorded for control group prior to intervention. During intervention no vomiting was recorded for abdominal massage group; while mean frequency of vomiting was 0.50 ± 0.36 times in control group in fifth day of intervention ($p=0.02$).

Day of intervention	Intervention group (N=14)	Control group (N=14)	p value
1 st day, ml (mean±SD)	2.25±1.21	6.36±3.56	0.150
2 nd day, ml (mean±SD)	1.42±1.21	4.27±5.07	0.004
3 rd day, ml (mean±SD)	1.90±0.71	3.94±4.86	0.002
4 th day, ml (mean±SD)	2.41±0.86	7.36±6.07	0.020
5 th day, ml (mean±SD)	2.43±1.93	4.25±4.71	0.040

Table 2. Mean gastric residual volume during different days of intervention

Mean abdominal circumference was 1.92 ± 26.21 cm in intervention and 2.42 ± 26.29 cm in control group before intervention ($p=0.93$). In the fifth day of study, intervention group had a mean abdominal circumference of 1.32 ± 24.32 cm and it was 2.18 ± 26.43 cm in control group ($p=0.005$). Before intervention,

mean weight was 330 ± 1830 gr in intervention and 370 ± 1870 gr in control group ($p=0.82$). In the fifth day of intervention mean weight was 323.15 ± 1871 gr in intervention group and 347.24 ± 1767 gr in control group ($p=0.001$).

Table 3 and figure 2 visualize the changing trend of mean weight in study individuals.

Day of intervention	Intervention group (N=14)	Control group (N=14)	p value
1 st day, gr (mean±SD)	331.68±1815	343.48±1827	0.200
2 nd day, gr (mean±SD)	321.93±1816	337.75±1814	0.120
3 rd day, gr (mean±SD)	322.70±1836	344.96±1805	0.008
4 th day, gr (mean±SD)	328.5±1847	345.48±1795	0.001
5 th day, gr (mean±SD)	323.15±1871	347.24±1767	0.001

Table 3. Mean weight of study individuals during different days of intervention.

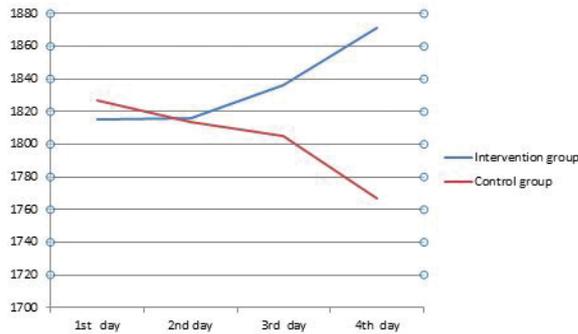


Figure 2. Change trend in mean weight of infants during intervention

Mean defecation frequency was 0.78 ± 1 times in intervention and 1.25 ± 1.79 times in control group prior to intervention ($p=0.06$). In the fifth day of intervention it was 0.84 ± 4.36 times in intervention and 0.78 ± 1 times in control group infants ($p=0.001$).

Discussion

We found that abdominal massage significantly improves weight gaining of premature infants admitted in NICU ward and decreases gastric residual volume (GRV). We also realized that infants in control group had vomiting more frequently than infants who underwent abdominal massage. In addition, it was concluded that abdominal massage increased defecation frequency in intervention group.

Comparison of gastric residual volume in different days of intervention showed that there is a significant difference between intervention and control groups from second day of intervention on; infants who had underwent abdominal massage had a significantly lower gastric residual volume. This is in agreement with Tekgündüz et al. study; however in their study gastric residual volume had decreased in the last day of intervention (5). In another study by Valizadeh et al. they have mentioned that gastric residual volume had decreased in infants receiving Kangaroo mother care. Results of Törnhaage et al. study showed that massage and Kangaroo

mother care significantly increases plasma Cholecystokinin level in preterm infants with Nasogastric tube feeding which results in more peristaltic movements of gastrointestinal tract (7).

Vomiting is one of the most important complications of feeding which increases the risk of pneumonia and aspiration (8). In concordance with Tekgündüz et al. study, infants in abdominal massage group had less vomiting in comparison with baseline in the present study (5). As an indicator of abdominal distention, abdominal circumference was significantly lower in abdominal massage group in fourth day of the trial which confirms the results of Tekgündüz et al. study (5).

In the present study, body weight showed a decrease in control group infants during study; while it was significantly increased in infants undergoing abdominal massage which is in accordance with Tekgündüz et al. study (5). In Badiee et al. study, abdominal massage for five consecutive days (three times a day) was resulted in higher weight gain of premature infants (6). In another similar study by Hosseinzadeh et al., mean weight gain of infants in abdominal massage group was 56 gr more than control group (9). Additionally, abdominal massage with coconut oil has been shown to be effective on weight gaining of infants (10).

It has been proved that abdominal massage increases vagal tone and gastric motility leading to higher frequency of defecation and weight gain (13-11). It accelerates peristaltic movements through effects on intra-abdominal pressure and stimulation of reflexive movements of intestines (15,14). Frequency of defecation is a determining factor which decreases the abdominal distension and results in more Bilirubin excretion. In our study, frequency of defecation was significantly higher in infants who received abdominal massage from third day of intervention on which is

in line with Lin et al., Tekgündüz et al. and Badiee et al. studies (16,6,5).

In conclusion our findings suggest that abdominal massage efficiently decreases gastric residual volume and helps with weight gain in preterm infants. We also found that abdominal massage decreases vomiting and increases frequency of defecation in enterally fed infants. Further studies are recommended to evaluate the effect of simultaneous abdominal massage and Kangaroo mother care on duration of hospitalization in preterm infants. Also the effects of abdominal massage on reducing Bilirubin levels, infections and increasing arterial blood saturation in preterm infants should be investigated in future researches.

Authors' Contributions

MG collected the data and drafted the manuscript. BN helped with data collection and drafting manuscript. MHK analyzed the data and edited the manuscript critically. MN designed the study and helped with final approval of the manuscript. All authors approved the final version of the manuscript.

Conflict of Interest Disclosures:

There are no conflicts of interest in terms of the present manuscript.

Ethical approval/Consideration

A written informed consent was taken from the patients' guardians. Their information was kept confidential and if they were interested in knowing the interpretation of their results, they were informed about it. No cost posed to the participants for their participation in this study.

Reference:

1. Rezaeian M, Goujani R, Sheikh Fathollahi M, Vaziri Nejad R, Manshori A, Razi S. A Comparative Study on Prevalence of Preterm Birth and Low Birth Weight in Iranians and Afghans Races in Rafsanjan Nik-Nafs Hospital in 2012-2011. *Journal of Rafsanjan University of Medical Sciences*. 82-67:(1)13;2014.
2. Golchin M, Rafati P, Taheri P, Nahavandinejad S. Effect of deep massage on increasing body weight in low birth weight infants. *KAUMS Journal (FEYZ)*. 50-46:(1)14;2010.
3. Valizadeh S, Hosseini MB, Karimijavan G. Effect of Oral Massage vs. Non-nutritive Sucking on Attainment of Independent Oral Feeding and Duration of Hospitalization in NICU: a Randomized Trial. *Journal of hayat*. 47-38:(1)20;2014.
4. Amini E, Ebrahim B, Dehghan P, Fallahi M, Sedghi S, Amini F, et al. The effect of massage therapy on weight gain and calories intake in premature neonates: a brief report. *Tehran University Medical Journal TUMS Publications*. 8-674:(10)71;2014.
5. Tekgündüz KŞ, Gürol A, Apay SE, Caner İ. Effect of abdomen massage for prevention of feeding intolerance in preterm infants. *Italian journal of pediatrics*. 1:(1)40;2014.
6. Badiee Z, Samsamshariat S, Pourmorshed P. Massage Therapy by Mother or Nurse: Effect on Weight Gain in Premature Infants. *Journal of Isfahan Medical School*. 144(29);2011).
7. Törnåge C-J, Serenius F, Uvnäs-Moberg K, Lindberg T. Plasma somatostatin and cholecystokinin levels in preterm infants during kangaroo care with and without nasogastric tube-feeding. *Journal of Pediatric Endocrinology and Metabolism*. 52-645:(5)11;1998.
8. Uysal N, Eser I, Akpınar H. The effect of abdominal massage on gastric residual volume: A randomized controlled trial. *Gastroenterology Nursing*. 23-117:(2)35;2012.
9. Hosseinzadeh K, Azima S, Keshavarz T, Karamizadeh Z, Zare N. The Effects of Massage on the Process of Physical Growth among Low-Weight Neonates. *Journal of Isfahan Medical School*. 165(29);2012).
10. Saeedi R, Gholami M, Dinparvar S, Kabirian M. Transcutaneous Feeding: The effect of massage with coconut oil on weight gaining in preterm newborns. *Iranian Red Crescent Medical Journal*. 9)2011;2011, Sep):9-666.
11. Diego MA, Field T, Hernandez-Reif M. Vagal activity, gastric motility, and weight gain in massaged preterm neonates. *The Journal of pediatrics*. 5-50:(1)147;2005.
12. Field T, Diego M, Hernandez-Reif M. Potential underlying mechanisms for greater weight gain

- in massaged preterm infants. *Infant Behavior and Development*. 9-383:(3)34;2011.
13. Moyer CA, Rounds J, Hannum JW. A meta-analysis of massage therapy research. *Psychological bulletin*. 3:(1)130;2004.
 14. Harrington KL, Haskvitz EM. Managing a patient's constipation with physical therapy. *Physical therapy*. 9-1511:(11)86;2006.
 15. Liu Z, Sakakibara R, Odaka T, Uchiyama T, Yamamoto T, Ito T, et al. Mechanism of abdominal massage for difficult defecation in a patient with myelopathy (HAM/TSP). *Journal of neurology*. 2-1280:(10)252;2005.
 16. Lin C-H, Yang H-C, Cheng C-S, Yen C-E. Effects of infant massage on jaundiced neonates undergoing phototherapy. *Italian journal of pediatrics*. 1:(1)41;2015.

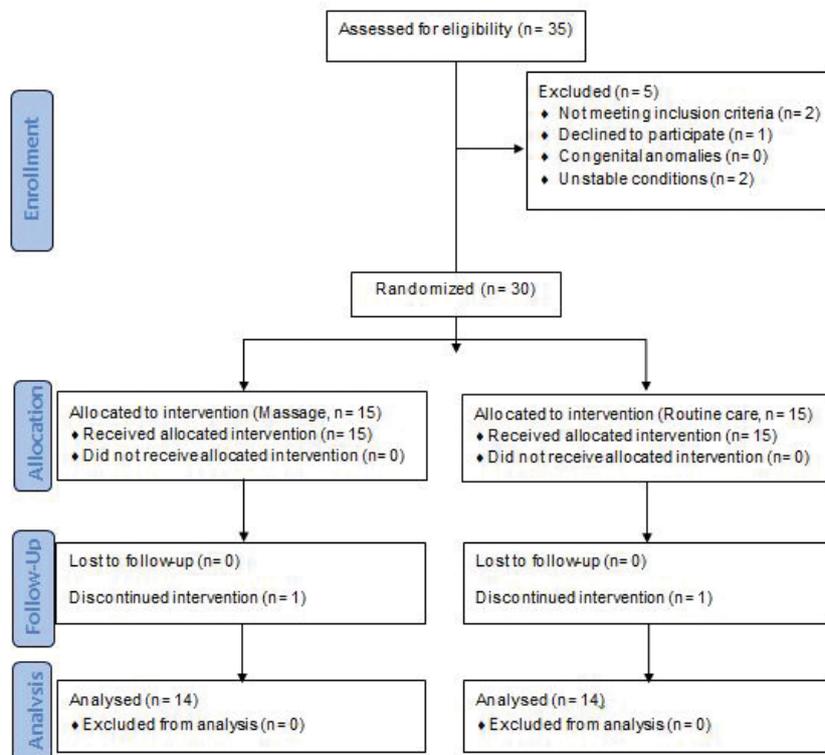


Figure 1. Study flowchart