



The efficacy of massage on short and long term outcomes in preterm infants



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ABSTRACT

Purpose: Premature infants lack the tactile stimulation they would have otherwise experienced in the womb. Infant massage is a developmentally supportive intervention that has been documented for several decades to have a positive effect on both full term and preterm infants. The purpose of this study was to assess the short and long term benefits of massage on stable preterm infants.

Methods: A quasi experimental design was used, 66 infants were recruited from two university hospitals with tertiary level NICUs; 32 infants received the massage therapy by their mothers. Data collection by a researcher blind to the infants' group assignments included weight at discharge, pain responses on the PIPP scale at discharge, length of stay in hospital, neuro-developmental outcome (Bayley scores) and breastfeeding duration at 12 months corrected age.

Results: Infants who were massaged had significantly lower scores on the PIPP after a heel-stick compared to before the massage and had lower PIPP scores at discharge compared to the control group. Massaged infants had higher cognitive scores at 12 months corrected age. Weight gain, length of stay, breastfeeding duration and motor scores did not differ between groups.

Conclusion: Stable preterm infants benefit from massage therapy given by their mothers and may be a culturally acceptable form of intervention to improve the outcomes of preterm infants.

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Improved technology and treatment modalities have enhanced the outcomes of preterm infants yet have increased the days they spent in the Neonatal Intensive Care Unit (NICU). Separated from their mothers and admitted to the NICU directly after birth, for weeks and often for months, they are subjected to a highly stressful environment and to intensive invasive and painful treatments necessary for their survival. It has been postulated that these painful and stressful treatments play a role altering brain maturation and in negatively affecting the neurobehavioral outcomes of preterm infants (Rangon, Fortes, & Lelievre, 2007; Smith, 2012). In attempts to decrease the stress of the NICU and relieve pain in preterm infants, researchers have investigated a range of interventions in the past three decades. The aim of interventions is to improve neurologic and behavioral outcomes both short and long term (e.g. Als, Duffy, & McAnulty, 2004; Cignacco et al., 2012; Johnston, Campbell-Yeo, & Fillion, 2011; Vandenberg, 2007). While some interventions such as sucrose and kangaroo care

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have provided conclusive evidence as to their efficacy in both decreasing pain and promoting the wellbeing of preterm infants, other interventions have not provided strong evidence to date (Badr, Abdallah, & Purdy, 2011).

In addition, to the painful experiences in the NICU, premature infants lack the tactile stimulation they would have otherwise experienced in the womb. The sense of touch is the fastest-developing sense in the infant following birth and is particularly important for the growing and developing preterm infants who are often deprived of gentle human touch. Kangaroo care is an intervention that provides infants with positive tactile stimulation. However despite its popularity in developed countries, in many countries in the Middle East such an intervention may not be culturally acceptable. This could be due to the modesty of women; the lack of privacy in most NICUs and untrained staff to assist mothers (Badr et al., 2011; DeJong, Akik, El Kak, Osman, El-Jardali, 2007). Therefore, massage maybe an alternative intervention. Massage is defined as a systematic touch by human hands, which stimulates the tactile sense of the infant and which has been documented for several decades to have a positive effect on both full term and preterm infants. For preterm infants studies have documented increased weight gain (Ang et al., 2012; Field et al., 1987, 2004; Mathai, Fernandez, Mondkar, & Kanbur, 2001; Scafidi, Field, & Schanberg, 1993; Vickers, Ohlsson, Lacy, & Horsley, 2004), decreased pain responses (Diego, Field, & Hernandez-Reif, 2009; Jain, Kumar, & McMillan, 2006), improved digestion and less energy expenditure (Lahat, Mimouni, Ashbel, & Dollberg, 2007; Moyer-Mileur, Hale, Slater, Beachy, & Smith, 2012), increased temperature (Diego, Field, & Hernandez-Reif, 2008), a positive effect on Heart Rate Variability (Smith, 2012), a shorter length of hospital stay (Fucile, Gisel, Mcfarland, & Lau, 2011; Mendes & Procianoy, 2008; Vaivre-Douret, Oriot, Blossier, Py, Kasolter-Péré, & Zwang, 2009), reduced stress as reflected by lower serum cortisol levels (Guzzetta et al., 2009); enhanced maturation of electroencephalographic activity and of visual function (Guzzetta et al., 2011), an enhanced immune system and less sepsis (Ang et al., 2012; Acolet, Modi, & Giannakouloupoulos, 1993; Hernandez-Reif, Diego, & Field, 2007; Mendes & Procianoy, 2008), improved neurologic, motor and behavioral development (Guzzetta et al., 2011; Procianoy, Mendes & Silveira, 2010), and modified sleep patterns as reflected by EEG power spectral density (Guzzetta et al., 2011).

A recent meta-analysis of 17 studies concluded that massage intervention improves daily weight gain and reduces length of stay but has limited effects on neurodevelopmental outcomes (Wang, He, & Zhang, 2013). An earlier review by Field, Diego, and Hernandez-Reif (2010a, 2010b) also states that moderate massage therapy leads to weight gain in preterm infants and shorter hospital days. However they indicate that the underlying mechanisms for the benefits of massage are not well understood and further research is necessary.

Based on the above, the purpose of this study was to assess the efficacy of massage on preterm infants taking into consideration the paucity of evidence to date and the limitations addressed in earlier studies. These include 1) massage provided by mothers found in six studies (Ferber et al., 2005; Gonzalez et al., 2009; Kumar et al., 2012; Livingston et al., 2009; Procianoy, Mendes, & Silveira, 2010; Teti et al., 2009), 2) long term assessment at two years age was found in one study (Procianoy et al., 2010) and at 4 months in two studies (Fucile & Gisel, 2010; Teti et al., 2009), 3) the effect of massage on pain responses in two studies (Diego et al., 2009; Jain et al., 2006), the use of oils during massage found in six studies (Arora, Kumar, & Ramji, 2005; Field et al., 1996; Kumar et al., 2012; Sankaranarayanan et al., 2005; Vaivre-Douret et al., 2009) and the effect of massage on the duration of breastfeeding in one study where the subjects were full term infants (Serrano, Doren, & Wilson, 2010).

Both short and long term outcomes were assessed in this study. Short term outcomes included weight gain in the NICU (calculated as average daily weight gain as well average weight gain during the NICU stay), length of hospital stay (LOS) and pain responses to a heel-stick procedure. Long term outcomes were duration of breastfeeding and mental and motor development at 12 months corrected age.

1. Methods

1.1. Design

A quasi experimental design was used to meet the objectives of this study. Settings: The setting for this study involved two university hospitals with tertiary level NICUs in Beirut-Lebanon. Each unit consisted of 20–25 beds with a neonatologist on site. The NICU environments in both hospitals did not have any protocols related to cluster care or developmental care and there was no policy for noise or light levels control. Heel-sticks are performed every 4 h, as a routine policy in both hospitals. Mothers are encouraged to breastfeed as soon as the infant was able to suck and to express their milk in a designated room with an electrical breast pump (Badr et al., 2011).

1.2. Participants

Sixty-six participants were approached to participate in the study from both hospitals with no refusals. To avoid contamination between groups, the first group of infants recruited was assigned to the control group ($n=34$) and the second group was the intervention group ($n=32$) which was recruited immediately after. Both groups were recruited within 6 months. Power analysis for two independent groups based on the study by Field et al. (1987) found that 15 infants per group was sufficient to detect the effect of massage therapy on weight gain ($p=.01$, two-tail). Thus, a sample of 30 infants in each group was more than adequate. Preterm infants were eligible for participation if they met the following criteria: (a) Gestational age (GA) is between 26 and 36 weeks assessed at delivery on the Dubowitz score, (b) Birth weight is between

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