Effect of Massage Therapy on Weight Gain and Hospital Stay for Premature Neonates

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Background: *Massage therapy is a non-invasive procedure that has positive effect on weight gain the **study aimed** to evaluate the effect of massage therapy on weight gain and hospital stay for premature neonates. **Design:** A quasi-experimental research design was used **Subjects and Settings:** A convenient sample of forty four premature neonates were chosen from the (NICU) at Assiut University Children Hospital and Assiut General Hospital, according to inclusion and exclusion criteria. **Tool:** A structural questionnaire sheet was developed and divided into three parts: **Part 1:** Socio-demographic characteristics of premature neonates. **Part II**- Clinical data of premature neonates which includes medical diagnosis and types of feeding . **Part III**- Assessment of weight before intervention, after five days and on discharge. **Results:** The majority of premature neonates of the interventional group had weight gain after five days from application of massage therapy and on discharge compared to those in the control group. The premature neonates in the interventional group had a short period of hospitalization in comparison to the control group. **Conclusion:** Applying of massage therapy had a positive significant effect on premature neonates' weight gain in addition to decreasing their length of hospital stay. **Recommendations:** Massage therapy should be included in neonatal intensive care unit (NICU), as standard of care for stable premature neonates, training programs should be provided to health care professional , especially pediatric nurses.*
Key Words: *Massage therapy, premature neonates.*

I.   Introduction

Premature neonates are surviving at younger gestational ages, with the help of modern technology, but not without significant morbidity. Worldwide, fifteen million babies are born prematurely every year, this is equals to one in ten births **(World Health Organization, (WHO, 2014)**.The rate of premature births has increased over the last twenty years. This is because of increased maternal age, increased rate of pregnancy related complications. premature is defined as all births born before completed 37 weeks of gestation since the first day of a women' last menstrual period. premature birth has long-term adverse consequences for health and is a major factor of neonatal mortality and morbidity **(WHO, 2012)**.

The significance of premature birth lies in the high incidence of morbidity and mortality related to prematurity and the impacts of these complications on the infants' survival and subsequent growth and development **(Saigal & Doyle, 2008, Moster et al., 2008). Liu et al., (2016)** reported that premature birth affected about one of every ten babies born in the United States, the rate of premature birth among African-American women was about fifty percent higher than the rate of premature birth among white women. Also, **Gill & Boyle, (2016)** estimate that around 60,000 babies are born prematurely in the UK every year, this means that one in every thirteen babies born in the UK will be born prematurely. **Hassan, et al., (2014)** mentioned that the incidence of prematurity in the year 2010 was 42.8 % of the total admission to neonatal intensive care unit (NICU) at Assiut University children Hospital.

Allen et al., (2011) stated that, there were a progressive decrease in premature neonates mortality over the past fifty years. A lowering of the age limit of viability and an increase in premature birth numbers has made premature birth a significant public health issue. **Bonifacio et al., (2011)** noted that, despite advances in technology, the number of premature neonates with neurodevelopmental compromise remains high. **Saigal & Doyle, (2008)** illustrated that, in recent years the focus of improving premature outcomes has shifted from increasing survival to minimizing morbidity and improving neurodevelopmental outcomes**.**

The premature neonates face many challenges during their first months of life. They are supposed to be in a well-protected womb and instead they are introduced to a hostile environment while their bodies are not ready for. Premature neonates are vulnerable to a numbers of problems and need special nursing care **(Karbasi et al., 2013).** The premature neonates may be admitted in NICU and the NICU presents premature neonates with a challenging environment–filled with noisy and mysterious equipment. Also filled with bright lights, unpleasant and painful stimuli with policy of minimal touch to avoid acquired infection which causes that neonates are deprived of tactile and sensory stimulation that is important in their growth outcome **(Aly & Murtaza, 2013).**

Therefore, modification of premature neonates environment could minimize the iatrogenic effects, developmental interventions; reduce neurodevelopment delay, poor weight gain, length of hospital stay, length of mechanical ventilation, physiological stress and other clinically relevant adverse outcomes. Such modification includes the use of appropriate massage therapy **(Symington & Pinelli, 2006).**

Massage therapy (MT) is one of the evidence-based nursing performances for increasing weight for the premature neonates **(Fallah et al., 2013).** Massage therapy technique is a gentle, structured, comforting touch, relaxation method aimed at limiting stress and anxiety in fragile intensive care neonates. It considered central in nursing knowledge and practice **(Smith, 2013; Smith et al., 2012).** Massage therapy facilitating development and growth of neonates through its effects on increasing their blood flow, heart rate, digestion, and immunity **(Ang et al., 2010).**

Massage is one of the safe interventions that nurses use for premature neonates in order to enhance their development. Nurses can play an important role in applying massage therapy on their premature neonates. Nurses working in NICU must educate the parents on how to provide massage for premature neonates to enhance parents' child attachment and interaction and to facilitate the weight gain**.** Also, the nurse educate the parents about the risks and benefits of massage therapy **(Ramezani et al., 2017).**

Significance of the study:

The premature neonates are losses the calm uterus environment that is full of sensory stimulations required for their growth and are placed in the NICUs. Whereas, impairment in growth at early infancy, and that can have permanent impacts on the future health of the neonates. The restriction caused in growth of premature neonates can stay with them till puberty (**Islami et al., 2012**, **Waldemar et al., 2011).** Little studies are known about the effects of massage therapy on premature neonates in Egypt. So the researchers applied massage therapy to provide the premature neonates with complementary stimuli and asses its effect on their weight gain and length of hospital stay in the NICUs.

Purpose of the Study:

To evaluate the effect of massage therapy on weight gain and hospital stay for premature neonates.

Research Hypotheses :

1-Premature neonates who receive massage therapy will have better weight gain than premature neonates who will not.

2- Premature neonates who will receive massage therapy intervention will have a short period of hospitalization than neonates who will not.

II. Subjects and method:

Research Design:

A quasi experimental research design was used.

Study setting:

The study was conducted in neonatal intensive care unit (NICU) at Assiut University Children Hospital, and Assiut General Hospital (related to Ministry of Health) in Assiut City, Egypt.

Subjects:

The study included a convenient sample of 44 premature neonates. The Subjects was assigned randomly into two equal groups. Interventional group (22 neonates received massage therapy beside the routine care) and control group (22 neonates received the routine care only). Sample size has been calculated using the following equation: $N = (Z^2 p \times q)/D^2$ at CI 90% and power 80%. All premature neonates who met inclusion criteria were selected:

Inclusion Criteria:

- Weight ≤ 2.500 grams.
- Gestational age was ranged between 32-34 weeks.
- Apgar score >7 and no resuscitation required at birth.

- Premature neonates with mild respiratory distress syndrome, elevated bilirubin and poor sucking reflex were not excluded**.**

Exclusion Criteria:

- Neonates who require surgery or have intrauterine growth retardation (IUGR)
- Neonates with infection or any congenital malformations

Instrument of the study:

One instrument was used for data collection.

A Structural interview questionnaire used for data collection. It was developed by the researchers to obtain the following information and divided into three parts:

Part 1: Socio-demographic characteristics of premature neonates (age/week, gestational age, gender, birth weight/gm., and type of delivery).

Part II- Clinical data of premature neonates which includes: medical diagnosis, such as: premature neonates with mild respiratory distress syndrome, with poor sucking reflex and neonatal jaundice (NJ). Types of feeding such as: bottle, intravenous fluids and nasogastric tube.

Part III- Assessment of weight before intervention , after five days and on discharge.

Method of Data Collection:

1- Administrative stage:

An official approval letter from the Faculty of Nursing in Assiut was prepared by the researchers and delivered to the chairmen of Neonatal Intensive Care Unit in Assiut University Children Hospital and Assiut General Hospital in Assiut city, to facilitate and carry out this study.

2-For Protection of Human Rights:

The researchers gave clear and simple clarification of the study nature and its expected outcomes to the parents and informed about the privacy of their information, the study was voluntary and harmless. The parents had the full right to refuse to participate or withdraw their neonates at any point of the study. A written consent from parents were obtained.

3-Instrument development:
- One instrument a structural interview questionnaire was utilized for data collection. Instrument was developed by the researchers after a reviewing of past and current, local and international literature related to premature neonates using books, articles, periodicals and magazines to get acquainted with the various aspects of the research problem.
-For validity assurance purpose, instrument was submitted and it was tested for its content validity by five experts, four experts from pediatric nursing and one professor of neonatology. where its value was 0.98. Reliability of the tool was estimated by Cronbach's Alpha test and its value was R=97%.

4- A pilot study:
It was carried out on five premature neonates (10%) of the subjects to test the clarity and applicability of the study instrument, and time needed for data collection. No modifications were done as revealed from the pilot study. The sample of the pilot study were included in the total sample.

5-Implementation Phase:
1- Data was collected from beginning of September 2016 to April 2017.
2-The massage therapy was done for interventional group by the researchers 24 hours after delivery of premature neonates and continued for 5 consecutive days. It consisted of three sessions. The first session was one hour after the morning feeding, the second session was 30 minutes after the mid-day feeding, and the third session was 45 minutes after the completion of the second session. Each session consisted of 5 minutes of massage therapy application.
3-Massage therapy applied according to the following sequence: The neonates would be placed in prone position. The researchers would warm up their hands first and were quiet during therapy. The massage applied gently by using the ventral part of the fingers. The whole massage was divided into 5 sections of 1 minute for each and the massage therapy repeated 5 times in each section . In the first section, massage was started from the head to the posterior neck and back to the head. In the second section, massage started from the posterior neck to the shoulders and back to the posterior neck. In the third section, massage started from the shoulders down to the buttocks and back to shoulders. The fourth section included simultaneous massage of both legs from the hip down to the soles and back. The fifth section included both hands from the shoulders to the wrists and back to shoulders simultaneously **(Badiee et al., 2012).**

6-Evaluation Phase:
Evaluation was done after five days from application of massage therapy and on discharge. It included reassessment of body weight daily at a standard time each day before feeding with digital electronic scale and was approximated to the nearest gram, Also, date of discharge was recorded.

Statistical analysis:
Data analyses were performed with the IBM SPSS 20.0 software. Categorical variables were described by number and percent (N, %), where continuous variables were described by mean and standard deviation (Mean, SD). Chi-square test and Fisher exact test were used to compare between categorical variables, where comparing between continuous variables was done by Mann-Whitney test ,. A two-tailed $p < 0.05$ was considered statistically significant.

III. Results

Table (1): Characteristics of premature neonates of the interventional and control groups.

| Characteristics	Interventional Group n=22		Control Group n=22		X^2	P. value
	No	%	No	%		
Age/week:						
1-	14	63.6	16	72.7	0.42	0.517[ns]
2-	8	36.4	6	27.3		
Mean ± SD	1.5+0.74		2.0+2.1		z=-0.256	0.798[ns]
Gestational age/week:						
32-33	16	72.7	14	63.7	0.82	0.664[ns]
34	6	27.3	8	36.3		
Mean ± SD	32.7+0.89		32.9+0.92		z=-0.855	0.393[ns]
Gender:						
Male	8	36.4	13	59.1	2.28	0.131[ns]
Female	14	63.6	9	40.9		
Birth weight/gm:						
1000<1500	8	36.4	7	31.8	2.08	0.354[ns]
1500<2000	9	40.9	13	59.1		
2000-2500	5	22.7	2	9.1		
Mean ± SD	1614.7+346.2		1690.3+289.7		z=-0.376	0.707[ns]
Type of delivery:						
Normal vaginal delivery	6	27.3	9	40.9	0.91	0.340[ns]
Cesarean section	16	72.7	13	59.1		

* Mann-Whitney test

Table (1): illustrates, that 63.6% of the interventional group aged from one week to less than two weeks compared to 72.7% of those in the control group. Regarding to gestational age 72.7% of the interventional group and 63.7% of control group were born 32 to 33 weeks of gestation. Less than two thirds (63.6%) of interventional group were females compared to (40.9%) in the control group. Regarding to birth weight 40.9% of the interventional group compared to 59.1% of control group had birth weight ranged from 1500<2000 gm. On the other hand, less than three quarters and more than half of the two groups (72.7% and 59.1%) respectively were delivered through cesarean. section. No statistically significant differences were detected between the two groups regarding all characteristics before the intervention.

Table (2): Frequency and percentage distribution of medical diagnosis, types of feeding and weight before intervention for both groups.

Items	Interventional Group n=22		Control Group n=22		X^2	P. value
	No	%	No	%		
Medical diagnosis:						
Mild respiratory distress (RDs)	14	63.6	16	72.7	0.80	0.670^{ns}
MRDs & poor sucking	4	18.2	2	9.1		
MDRs & neonatal jaundice	4	18.2	4	18.2		
Types of Feeding:						
Bottle feeding	14	63.6	9	40.9	3.01	0.222^{ns}
I.V	4	18.2	9	40.9		
Nasogastric tube feeding	4	18.2	4	18.2		
Weight before intervention/gm:						
1000-	9	40.9	7	31.8	2.73	0.256^{ns}
1500-	8	36.4	13	59.1		
2000-2500	5	22.7	2	9.1		
Mean ± SD	1572.7+369.2		1678.9+289.8		z=-0.482	0.630^{ns}

* Mann-Whitney test

Table (2): clarifies, that 63.6%, and 72.7% of the interventional and control groups respectively were premature associated with mild respiratory distress syndrome. Regarding to the types of feeding 63.6% vs.40.9% of the both groups received bottle feeding only. Concerning to the weight before intervention 40.9% of the interventional group compared to 31.8% of the control group had weight from 1000 to less than1500 gm. with mean+.SD (1572.7+369.2 and 1678.9+289.8, respectively). No statistically significant differences were detected between the two groups regarding all items.
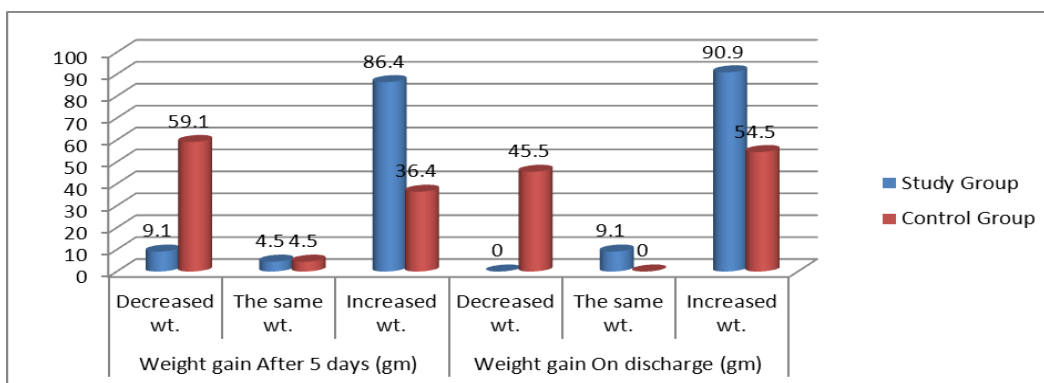
Figure (1): Relation between interventional and control groups as regards weight gain after massage therapy

Figure (1): shows, that the majority of premature neonates of the interventional group 86.4% and 90.9% had weight gain after five days from application of massage therapy and on discharge compared to 36.4% and 54.5% of those in the control group .

Table (3): Distribution of premature neonates according to their length of hospital stay for both groups after applying massage therapy.

Items	Interventional group n=22		Control n=22		X^2	P. value
	No	%	No	%		
Length of hospital stay/days:						
2-4 days	15	68.0	6	27.0	8.95	0.011*
5-9 days	6	27.0	9	41.0		
≥10	1	5.0	7	32.0		
Mean ±SD	10.73±3.50		15.05±3.28			0.001**

Mann-Whitney test   **P<0.05**

Table (3) demonstrates, that more than two thirds (68.0%) of interventional group stayed from 2-4 days in the hospital after applying massage therapy compared to more than one quarter (27.0%) of those in the control group. Statistically significant difference was found between both groups with mean ±SD (10.73±3.50 vs. 15.05±3.28)**.**

IV. Discussion

The premature are the classic high risk neonates because of their immature organs . Immature lung tissue and respiratory distress syndrome (RDS) are the most common problems that indicate the need for neonatal intensive respiratory care **(Whitsett, 2005).** It is important for neonatal care givers to focus on progresses in premature infants' health and to save their lives. Recently, important emphasis has been placed on complementary treatment and supportive strategies for developmental and mental health **(Altimier, 2007).** Massage is one of the master key of complementary treatment. Complementary treatment is a crucial nursing practice for neonates **(Turnage Carriea, 2010).**

The findings of the current study reported that no statistical significant difference was found between the interventional and control groups regarding mean weight of premature neonates before applying massage therapy **(Table 2)**. The result of the present study in the same line with **Fayed (2016)** who revealed that no statistical significant differences were found between the study and control groups regarding mean weight of newborn before intervention.

Massage therapy is relatively simple effective and safe non-invasive procedure that can increase the weight in premature neonates. The majority of premature neonates of the interventional group had weight gain after five days from application of massage therapy and on discharge compared to those in the control group as shown in **(Figure 1) .** The finding of the current study was supported by **Karbasi, et al., (2013), Badiee, et al., (2012).** Also, the study results were similar to the findings of **Golchin et al., (2010) and Tekgündüz et al., (2014)** who mentioned that weight gain is the most consistent indicator which is associated with massage therapy in neonates. Also, stable neonates who were massaged for five days, three times/day by a well-trained nurse, significantly increase in their weight than those who didn't receive massage therapy. In addition, **Field, et al.,(2010), Aly & Murtaza (2013)** mentioned that body massage increased mean weigh of neonates and it can be used as a simple effective and safe non-invasive procedure.

The increase in weight gain for interventional group can be explained by massage therapy, can improve weight gain of neonates by increasing vagal activity, more sucking increased insulin release, reduced energy expenditure, decrease norepinephrine serum level, increased gastric motility and better absorption of nutrients. Also, the massage therapy improved premature neonates' circulation and increased blood supply to the stomach that accelerates gastric motility and digestion **(Manju and Shilpi , 2014)**.

Regarding the length of hospital stay, the finding of the current study illustrated that the premature neonates in the interventional group had a short period of hospitalization in comparison to the control group **(table 3)**. These results agree with **Bayomi & El-Nagger (2015)** who reported that, more than half of premature neonates their length of hospital stay ranged between 2-4 days after applying massage therapy**.** Also, the results was consistent with **Fayed (2016)** who mentioned that concerning period of hospitalization for the newborn in the study and control groups, the study indicated that newborn in the study group have a short period of hospitalization**.**

In addition, the results agree with **Diego et al., (2009)** who stated that massage therapy has a significant impact on weight gain of premature neonate with shortening of hospital stay of up to six days. Moreover**, Ang et al., (2012)**, **Mutlu et al., (2011)** revealed that, massage therapy enhanced immune system and less sepsis that leading to decrease length of hospital stay. This can be explained as the premature neonates in the interventional group had discharge early from NICU due to better weight gain as a result of applying massage therapy intervention.

V. Conclusion:
It can be concluded from the findings of the current study that, massage therapy is a simple effective and safe non-medical intervention and its applying had a positive significant effect on premature neonates' weight gain in addition to decreasing their length of hospital stay.

VI. Recommendations:
Based on the findings of the current study, the following recommendations were suggested:

1- Massage therapy should be included in neonatal intensive care unit (NICU), as standard of care for stable premature neonates.

2- Further study should be conducted in all NICUs to assess the neonatal nurse's knowledge, attitudes and performance regarding massage therapy and its effect on health status of premature neonates.

3- Training programs should be provided to health care professional, especially pediatric nurses in NICU to increase their skills in applying massage therapy to premature neonates who are medically stable.

4- Encourage the mothers to apply massage therapy pre discharge through teaching sessions and using booklet.

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