

## Effect of Abdominal Massage Therapy on Feeding Tolerance of Premature Neonates

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### Abstract:

**Background:** Gastrointestinal tract of premature neonates is developmentally immature placing them at high risk for developing feeding intolerance and/or necrotizing enterocolitis. It is important to consider the immaturity of the premature neonate intestinal tract which can cause decreased gastric emptying, slower intestinal motility, decreased gastrointestinal hormones, enzymes and juices, which all affect overall digestion and feeding tolerance.

**Aim:** was to determine the effect of abdominal massage therapy on feeding tolerance of premature neonates.

**Settings:** The study was conducted at the Neonatal Intensive Care Unit at Tanta University Hospital. **Subjects:** convenience sampling of 60 premature Neonates'. **Tools:** Two tools were used for data collection. The first tool was Bio-socio-demographic Data. The second tool was nutritional assessment of premature neonate. **Results:** Findings of the present study revealed that all of premature neonates in both massage groups had less gastric residual, abdominal distention, vomiting and abnormal characteristics and consistency of stool in the last day of abdominal massage therapy compared to premature neonates in control group. The finding also revealed that, the premature neonates in both massage groups reached to full feeding faster than premature neonates in control group.

**Conclusion:** Premature neonates who received abdominal massage therapy took less time to reach full feeding than premature neonates in control group and exhibited less feeding intolerance criteria as less gastric residual, less abdominal distention, less vomiting and less abnormal defecation compared to premature neonates in control group.

**Recommendations:** Neonatal intensive care unit nurses' should attend training courses regarding massage therapy to gain knowledge about importance of massage and how to practice it effectively and Combination between medical and routine nursing care of premature neonates and abdominal massage technique should be considered in the policy of the Neonatal Intensive Care Units.

**Keywords:** Abdominal Massage Therapy, enter-colitis, Feeding Tolerance, Premature Neonates.

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### I. Introduction

Fetal stage and extra-uterine life form a continuum during which complex series of biologic, physiologic and metabolic changes occur <sup>(1)</sup>. The neonatal period is described as the period of time immediately after birth and lasting through the first month of extra uterine life, where the neonate adjusts from intrauterine life. Meanwhile, the first 24 hours of life constitute a highly vulnerable time, during which the neonate must make major physiological adjustment to extra uterine life. So, the nurse should accurately understand the neonatal characteristics and needs <sup>(2)</sup>. Approximately 65% of all deaths of neonates occur in the first year of life. The leading causes of mortality rate during the first 4 weeks of life are prematurity <sup>(3)</sup>.

World Health Organization (WHO), defined premature birth as all births born before completed 37 weeks of gestation since the first day of a women's last menstrual period <sup>(4)</sup>. 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 infant's survival and subsequent growth and development <sup>(5)</sup>. Based on WHO report (2016), more than 1 of 10 neonates were born prematurely worldwide, making an estimate of 15 million preterm births, of which more than 1 million die as a result of their prematurity <sup>(6)</sup>. Furthermore, over 60% of premature

births occur in Africa and South Asia <sup>(7)</sup>. According to the recorded statistics of Tanta University Hospital, the rate of premature neonate's admissions in the Neonatal Intensive Care Unit was 70% of total number of admission in 2016<sup>(8)</sup>.

Proper nutrition is essential for normal growth, resistance to infection, long term health and optimal neurologic and cognitive development. Providing adequate nutrition to preterm neonates is challenging because of several problems. These problems include immaturity of bowel function, inability to suck and swallow and high risk of feeding intolerance <sup>(9)</sup>.

Basically, the function of the Gastro-Intestinal Tract (GIT) among premature neonates is impaired related to early interruption of gestation <sup>(10)</sup>. Feeding Intolerance (FI) is common among preterm neonates, and most of them have episode that require either temporary discontinuation of feeding or delay in advancing feedings. The most frequent signs of suspected FI are presence of gastric residual, abdominal distention and vomiting <sup>(11)</sup>. High Gastric Residual Volume (GRV) may be related to the increase in the incidence of other Gastro-Intestinal (GI) complications such as Necrotizing Enterocolitis (NEC) <sup>(12, 13)</sup>. Early postnatal enteral feeding with small amounts of human milk or formula may improve the development of the GI tract, gut hormone release, and gut motility. Minimal enteral feeding has some clinical benefits, such as reducing the time to start full enteral feeding and length of hospitalization without increasing the risk of necrotizing enterocolitis<sup>(14)</sup>.

Massage is thus an intervention that may be useful in premature neonates. Massage therapy as non-invasive procedure that may have positive effect on physical and developmental growth of premature neonates. Performing massage therapy for premature neonates in Neonatal Intensive care Unit (NICU) is a kind of alternative treatment that has been the subject of long debates. Studies have indicated that neonates who receive massage are usually better adapted to environmental stressors and suffer less negative effects <sup>(15, 16)</sup>. Research on abdominal massage has been carried out for many years. Massage has been found to increase the neonate's serotonin level, vagal activity, gastric motility; reduces stress hormone levels, colic and support weight gain <sup>(17, 18)</sup>.

Neonatal Intensive Care Unit environment takes on an affirmative obligation not just to avoid harm or to remedy a specific illness, but also support all biological systems of premature neonates <sup>(19)</sup>. Neonatal intensive care nurses have increased responsibility in the care of premature neonates as they contribute significantly in providing safe and effective neonatal nursing care. So, it is crucial for NICU nurses to understand the neonatal history, current medical condition and anatomy and physiology of GIT <sup>(20)</sup>. Neonatal intensive care nurses should also understand the usefulness of massage therapy in promoting the health of premature neonates <sup>(15)</sup>. Ultimately, implementation of abdominal massage could enhance the GIT tolerance and growth parameters of premature neonates.

## **II. Aim of the study**

The study aimed to determine the effect of abdominal massage therapy on feeding tolerance of premature neonates

## **III. Subjects and Method**

**3.1 Study design:** A quasi-experimental research design was used in this study.

**3.2 Study hypotheses:** Premature neonates of the study groups who received abdominal massage therapy expected to be improved feeding tolerance and decreased incidence of feeding intolerance than control group.

**3.3 Study setting:** The study was conducted at the Neonatal Intensive Care Unit in Tanta University Hospital.

**3.4 Subjects:** A convenience sampling of 60 premature neonates who fulfilled following criteria comprised the study subjects:

- Birth weight ranging from 1000 to less than 2500 gram.
- Gestational age < 37 weeks.
- Premature neonates who started enteral feeding.
- Free from congenital anomalies which might interfere with abdominal massage.
- Free from neurological problems.

Premature neonates were assigned into three groups:

1-Control group: Twenty premature neonates who received routine hospital care.

2- Study group before feeding: Twenty premature neonates who received massage therapy before half hour of feeding as implemented by researcher.

3- Study group after feeding: Twenty premature neonates who received massage therapy after one hour of feeding as implemented by researcher.

The subjects were assigned to control group, or study group before feeding or study group after feeding as follows: the first 20 premature neonates in control group then the second 20 premature neonates in study group before feeding then the last 20 premature neonates in study group after feeding and so...on.

**3.5 Tools of the study:** In order to collect the necessary data for the study two tools were used:

**Tool (I): Bio-socio-demographic data:** Structure schedule to collect information about premature neonates it included: age when study started in days, sex and. Clinical features: Gestational age, birth weight.

**Tool (II): Nutritional Assessment of Premature Neonate**

The tool was developed by the researcher after thorough review of related literature to assess feeding pattern and gastrointestinal tolerance criteria of premature neonates. It included two parts:

**Part I: Premature Neonate Feeding Pattern** which include:

- Time of start feeding after delivery.
- Type of milk feeding
- Time to reach full feeding.
- Withheld feeding and their duration.

**Part II:** Observational check list feeding tolerance criteria through which included:

- Abdominal distension
- gastric residual volume
- Vomiting
- Abnormal defecation (constipation – diarrhea).

### **3.6 Method:**

1. An official Permission to conduct the study was obtained from the responsible authorities of the Neonatal Intensive Care Unit after explanation of the aim of the study.

#### **2. Ethical consideration:**

- Consent of premature neonates' parents were obtained after explaining the aim and nature of the study.
  - Parents were ascertained about confidentiality of their neonates' data
  - They had right to withdraw from the study at any time.
  - Privacy was considered
  - Professor of Physical Medicine, Rheumatology and Rehabilitation was trained the researcher on abdominal massage therapy for premature neonates before starting the study.
3. Tools were tested for their content validity by 5 experts in the Pediatric nursing Field and necessary modifications were done based on their comments. Test the reliability was conducted for tool II, Cronbach's alpha test was 0.95.
4. A pilot study was carried out on 6 premature neonates (2 for each group) to test the feasibility and clarity of tools and accordingly necessary modifications were done. Those premature neonates were excluded from the study subjects.
5. At initial contact, premature neonates' demographic data, clinical features, feeding pattern, FI criteria and anthropometric measurements were assessed for three groups using tool I and II.
6. Every premature neonate was fed according to feeding protocol that was approved by the neonatologists at the unit. The massage schedule indicated when enteral feeds should be started.

#### **7. For the control group:**

- ❖ Premature neonate in control group was received feeding like the premature neonate in massage groups. This group was received only routine unit care of the NICU until reach to full feeding.

#### **8. For the study groups:**

- ❖ Study Group before feeding: Premature neonate was received abdominal massage therapy in addition to routine unit care. Abdominal massage was administered for 15 minutes twice per day before half hour of starting the feeding within the 7 days study period for each premature neonate then continues receive routine care until reach to full feeding.
- ❖ Study Group after feeding: Premature neonate was received abdominal massage therapy in addition to routine unit care. Abdominal massage was administered for 15 minutes twice per day after one hour of the feeding within the 7 days study period for each premature neonate then continues receive routine care until reach to full feeding.
- ❖ Glycerin was applied to the skin to facilitate the massage technique and reduce skin friction.

9. **Abdominal massage technique:** massage was applied to massage group subjects for 15 minutes, 2 times daily at 9:00 am and 3:00 pm before and after the subject feeding starting in the seven day study period. Massage application time and frequency were decided according to studies and expert opinions found in the literature. During massage application the premature neonate was placed in supine position with head of bed angle elevated at 30° - 45°. Abdominal massage was applied in a clockwise direction over the intestines on the abdominal wall. The strokes with moderate pressure was applied to the areas of premature neonate's abdomen:

- **Knees Up:** Hold the knees and feet together and gently press the knees up toward the abdomen. Rotate the premature neonate's hips around to the right was performed 10 times in 2 minute.

- **Water Wheel:** Hold hand so that the edge of little finger can move like a paddle across the premature neonate's abdomen. Starting at the base of the rib cage, stroke down ward with one hand and make a paddle-wheel-like motion with the other hand was performed 20 times in three minutes.
- Massage the abdomen with fingertips in a circular, clockwise motion was performed 20 times in two minutes.
- Walk fingers around the umbilicus Clockwise was performed 20 times in two minutes.
- Do the "I Love U" stroke as follows: Trace the letter I down the premature neonate's left side. Next, trace an inverted L, stroking across the abdomen along the base of the ribs from the right side to the left side and then downward. Trace an inverted U, stroking from down the premature neonate's right side upward and around the umbilicus and finally down the left side was performed 20 times in three minutes.
- **Sun and Moon** – Draw your right hand around your premature neonate's abdomen in a clockwise full circle and let your left hand follow, drawing a partial clockwise circle was performed 20 times in three minutes.
- When the neonate appeared to be in any distress during the intervention, the procedure was discontinued and neonate was examined by a neonatologist.

10- Gastric residuals was checked daily during study period just prior to each feeding among the three groups

11- Every premature neonate in all groups was monitored daily for evidence of FI which included abdominal distension, vomiting, abnormal stool characteristics (constipation or diarrhea) and increase gastric residuals until they reached to full feeding.

12- Premature neonate's body weight to the closest grams was measured daily at morning for the study period for all groups until they reached to full feeding. They were weighed naked before 9 AM feeding. Abdominal girth measured daily before each feeding (more than 2 cm leading to distention)<sup>(21)</sup>.

13- The study was completed when the neonate reaches full enteral feeding (140-160 ml/kg)<sup>(14, 22)</sup>.

14- Data were collected over 14 month during the period from November 2016 to December 2017

### **13-Statistical analysis:**

The raw data were coded and transformed into coding sheets. The results were checked. Data were analyzed using the statistical package for social science SPSS (version 20)

-Descriptive statistics including frequency, distribution, mean and standard deviation were used to describe different characteristics. Univariate analyses including: t-test and Mann Whitney test were used to test the significance of results of quantitative variables. Moreover, Chi-Square test, Monte Carlo test and Fisher's exact test were used to test for significance among qualitative variables. Level of significance for this study is equal to or less than 0.05%.

## **IV. Results**

**Table (1)** Illustrates percentage distribution of premature neonates regarding demographic characteristics. The table reveals that the mean age among premature neonates of the control and study groups were  $1.50 \pm .513$ ,  $1.70 \pm .801$  and  $1.65 \pm .671$  days respectively. More than half (55%) of premature neonates in control group were male compared to 50% and 40% respectively of premature neonates in both study groups. Regarding gestational age, it was observed that about two thirds of premature neonates of both control and study groups (70%, 65% and 70% respectively) had gestational age ranged from 30 to less than 34 weeks. It is revealed from the table that, about two thirds of premature neonates of control and both of study groups (70%, 65% and 70% respectively) had birth weight ranged from 1250 to less than 1400 grams.

**Table (2)** Represent percentage distribution regarding type of milk that received by premature neonates ,it was found the majority of premature neonates of both the control and study groups received preterm formula milk 90%, 85%, and 99% respectively).

**Table (3):** Shows percentage distribution of premature neonates regarding feeding patterns. More than half of premature neonates in control group and both study groups and control group started feeding within the first four days after birth (60%, 60% and 55% respectively). Regarding time to reach full enteral feeding (time from birth to reach full feeding) , the table revealed that all of premature neonates in both study groups reached to full feeding within a period of day 10 to less than day 20 (100 for each) . On the other hand three quarter (75%) of premature neonates in control group reached to full feeding within a period of day 20 to day 30 compared to none of premature neonates in both study groups. The mean time to reach full feeding in premature neonates in control group was  $23.30 \pm 2.598$  compared to  $12.20 \pm 2.167$  and  $12.50 \pm 2.373$  respectively in both study groups. There was statistical significant difference between control group and both the study groups regarding time to reach full enteral feeding where  $p = 0.000$ .

**Table (4):** Presents percentage distribution of premature neonates regarding feeding withhold. It was observed from the table that three quarters of premature neonates in control group withheld feedings (75%) compared to 20% and 30 % respectively of premature neonates in both the study groups. It was found from the same table that feeding was hold for 48 hours or more for two third (66.7%) of premature neonates in control group compared to none of premature neonates in both study groups. The mean hours of withheld feedings in premature neonates in control group was 98.71±85 compared to and 25.45±30 and 26.35±33 respectively in both study groups. There was statistical significant difference between control group and both the study groups regarding hours of withheld feedings where  $p < 0.000$ .

**Table (5):** Shows percentage distribution of premature neonates regarding effect of abdominal massage on gastric residual volume. In the first day of the study period, it was found that the majority (85%) of premature neonates in control group had gastric residual from 25 to 50% of the total amount of the feeding compared 30 % and 20% respectively of premature neonates of both study groups ( $P=0.051$ ). Regarding the third day of the study period ,it was found that 40% and 30% respectively of premature neonates in both study groups had no gastric residual compared to all of premature neonates in control group had gastric residual ( $P=0.001$ ). On the other hand, the table is reveals that none of premature neonates in both study groups in sixth and seventh day of the study period had gastric residual compared to all premature neonates in control group. The differences between three groups were highly statistically significant ( $P= 0.000$  in each day).

**Table (6):** As regards percentage distribution of premature neonates regarding effect of abdominal massage on abdominal distention. In the first day of the study period, it was found that none of premature neonates in control group and both study groups had abdominal distention (100% for each) .On the other hand, the table shows the majority (85%) of premature neonates in control group had abdominal distention compared to nearly two third of both study groups in the second day of study period (60% and 65% respectively). Additionally, none of premature neonates in both study groups in the fifth, sixth and seventh day of the study period had abdominal distention compared to 25%, 45% and 70% respectively of premature neonates in control group had abdominal distention. The differences between the control and study groups were highly statistically significant ( $P= 0.000$  in each day).

**Table (7):** Illustrates percentage distribution of premature neonates regarding effect of abdominal massage on vomiting, it was found that majority of premature neonate in control and both study groups had vomiting in the first day of the study period. On the other hand, the table is reveals that none of premature neonates in both study groups in the fifth, sixth and seventh day of the study period had vomiting compared to 30%, 25% and 40% respectively of premature neonates in control group had vomiting. The differences between control and study groups were highly statistically significant ( $P= 0.000$  in each day).

**Table (8):** Shows percentage distribution of premature neonates regarding effect of abdominal massage on stool characteristics. In relation to the first day of study period, it was observed that majority (85%) of premature neonates of the control group had constipation compared to 60% and 65 % respectively of premature neonates in both study group. On the other hand, the table is reveals that none of premature neonates in both study groups in the fifth, sixth and seventh day of the study period constipation compared to 25%, 45% and 35% respectively of premature neonates in control group had constipation. The differences between control and study groups were highly statistically significant ( $P= 0.000$  in each day).

**Table (1):** Percentage Distribution of Premature Neonates Regarding Demographic Characteristics

Demographic Characteristics	Control group n=20		Study group before feeding n=20		Study group after feeding n=20		Test of significance
	No	%	No	%	No	%	
<b>Age(days)</b>							
• 1 day	2	10.0	1	5.0	1	5.0	X <sup>2</sup> :5.109 P:0.220
• 2days	12	60.0	13	65.0	12	60.0	
• 3days	6	30.0	6	30.0	7	35.0	
<b>Min – Max</b>	1-3		1-3		1-3		
<b>Mean ± S.D</b>	1.60±.513		1.70±.801		1.65±.671		
<b>Gender</b>							
• Male	11	55.0	10	50.0	8	40.0	X <sup>2</sup> :1.200 P:0.581
• Female	9	45.0	10	50.0	12	60.0	
<b>Gestational age (weeks)</b>							
• 30 - < 34	14	70.0	13	65.0	14	70.0	X <sup>2</sup> :0.085 P:0.771
• 34 - <37	6	30.0	7	35.0	6	30.0	
<b>Min –Max</b>	30-34		30-35		30-34		

Mean ± S.D	32.00±1.214		32.35±1.182		32.00±1.214		X <sup>2</sup> :0.066 P:0.621
Birth weight							
• 1250- < 1400	14	70.0	13	65.0	14	70.0	
• 1400 ≤ 1500	6	30.0	7	35.0	6	30.0	
Min -Max	1250-1500		1280-1500		1250-1500		

**Table (2):** Percentage Distribution Regarding Type of Milk that Received by Premature Neonates

Premature Neonate Feeding Pattern	Control group n=20		Study group before feeding n=20		Study group after feeding n=20		Test of significance
	No	%	No	%	No	%	
Type of milk							
Expressed breast milk	1	0.5	1	0.5	0	0.0	X <sup>2</sup> : 16.155 P:0.448
Preterm formula milk	18	90.0	17	85.0	18	90.0	
Both	1	5.0	2	10.0	2	10.0	

**Table (3):** Percentage Distribution of Premature Neonates Regarding Feeding Patterns.

Premature Neonate Feeding Pattern	Control group n=20		Study group before feeding n=20		Study group after feeding n=20		Test of significance
	No	%	No	%	No	%	
Time of start feeding							
Before 5th day of birth	12	60.0	12	60.0	11	55.0	X <sup>2</sup> :58.897 P:0.253
on 5th day of birth or after	8	40.0	8	40.0	9	45.0	
Min-Max	2-5		2-6		2-5		
Mean ± S.D	1.60±.598		1.85±.745		1.75±.639		
Time to reach full enteral feeding							
< Day 10	0	0.0	0	0.0	0	0.0	X <sup>2</sup> :24.510 *P:<0.000
Day 10 to less than 20	5	25.0	20	100.0	20	100.0	
Day 20 -30	15	75.0	0	0.0	0	0.0	
Min-Max	17-30		11-17		11-18		
Mean ± S.D	23.30±2.598		12.20±2.167		12.50±2.373		

\* Significant at P<0.05

**Table (4):** Percentage Distribution of Premature Neonates Regarding Feeding withhold.

Premature Neonate Feeding Pattern	Control group n=20		Study group before feeding n=20		Study group after feeding n=20		Test of significance
	No	%	No	%	No	%	
Withheld feeding							
Not hold	5	25.0	16	80.0	14	70.0	X <sup>2</sup> : 14.126 *P: 0.005
Hold	15	75.0	4	20.0	6	30.0	
Number of withheld feeding	n=15		n=4		n=6		
< 48 hours	5	33.0	4	100.0	6	100.0	X <sup>2</sup> : 51.386 *P:<0.000
48 + hours	10	66.7	0	0.0	0	0.0	
Min-Max	15-150		6-33		8-36		
Mean ± S.D	98.71±85		25.45±30		26.35±33		

\* Significant at P<0.05

**Table (5):** Percentage Distribution of Premature Neonates Regarding Effect of Abdominal Massage on Gastric Residual Volume.

Gastric residual		Control group n=20		Study group before feeding n=20		Study group after feeding n=20		Test of sig
		No	%	No	%	No	%	
1 <sup>st</sup> day	No gastric residual	0	0	0	0	0	0	X <sup>2</sup> :9.805 *P:0.051
	< 25%	2	10.0	13	65.0	15	75.0	
	25-50%	17	85.0	6	30.0	4	20.0	
	More than 50%	1	5.0	1	5.0	1	5.0	
2 <sup>nd</sup> day	No gastric residual	0	0	0	0	0	0	X <sup>2</sup> :9.805 *P:0.051
	< 25%	2	10.0	15	75.0	15	75.0	
	25-50%	17	85.0	5	25.0	4	20.0	
	More than 50%	1	5.0	0	0.0	1	5.0	

3 <sup>rd</sup> day	No gastric residual	0	0.0	8	40.0	6	30.0	X <sup>2</sup> :18.193 *P: <b>0.001</b>
	< 25%	6	30.0	9	45.0	11	55.0	
	25-50%	5	25.0	3	15.0	3	15.0	
	More than 50%	9	45.0	0	0.0	0	0.0	
4 <sup>th</sup> day	No gastric residual	2	10.0	13	65.0	11	55.0	X <sup>2</sup> :25.568 *P: <b>&lt;0.000</b>
	< 25%	10	50.0	7	35.0	7	35.0	
	25-50%	5	25.0	0	0.0	2	10.0	
	More than 50%	3	15.0	0	0.0	0	0.0	
5 <sup>th</sup> day	No gastric residual	5	25.0	12	60.0	11	55.0	X <sup>2</sup> :15.851 *P: <b>&lt;0.000</b>
	< 25%	10	50.0	8	40.0	9	45.0	
	25-50%	0	00.0	0	0.0	0	0.0	
	More than 50%	5	25.0	0	0.0	0	0.0	
6 <sup>th</sup> day	No gastric residual	0	0.0	20	100.0	20	100.0	X <sup>2</sup> :38.835 *P: <b>&lt;0.000</b>
	< 25%	5	25.0	0	0.0	0	0.0	
	25-50%	11	55.0	0	0.0	0	0.0	
	More than 50%	4	20.0	0	0.0	0	0.0	
7 <sup>th</sup> day	No gastric residual	0	0.0	20	100.0	20	100.0	X <sup>2</sup> :39.379 *P: <b>&lt;0.000</b>
	< 25%	2	10.0	0	0.0	0	0.0	
	25-50%	13	65.0	0	0.0	0	0.0	
	More than 50%	5	25.0	0	0.0	0	0.0	

Table (6): Percentage Distribution of Premature Neonates Regarding Effect of Abdominal Massage on Abdominal Distention.

Abdominal distention (According to abdominal girth)		Control group n=20		Study group before feeding n=20		Study group after feeding n=20		Test of sig
		No	%	No	%	No	%	
1 <sup>st</sup> day	No	20	100.0	20	100.0	20	100.0	-
	Yes	0	0.0	0	0.0	0	0.0	
2 <sup>nd</sup> day	No	3	15.0	8	40.0	7	35.0	X <sup>2</sup> :5.714 P:0.466
	Yes	17	85.0	12	60.0	13	65.0	
3 <sup>rd</sup> day	No	6	30.0	15	75.0	13	65.0	X <sup>2</sup> :10.000 *P: <b>0.001</b>
	Yes	14	70.0	5	25.0	7	35.0	
4 <sup>th</sup> day	No	11	55.0	20	100.0	18	90.0	X <sup>2</sup> :13.125 *P: <b>0.000</b>
	Yes	9	45.0	0	0.0	2	10.0	
5 <sup>th</sup> day	No	15	75.0	20	100.0	20	100.0	X <sup>2</sup> :10.909 *P: <b>0.000</b>
	Yes	5	25.0	0	0.0	0	0.0	
6 <sup>th</sup> day	No	11	55.0	20	100.0	20	100.0	X <sup>2</sup> :18.462 *P: <b>&lt;0.000</b>
	Yes	9	45.0	0	0.0	0	0.0	
7 <sup>th</sup> day	No	6	30.0	20	100.0	20	100.0	X <sup>2</sup> :13.333 *P: <b>0.000</b>
	Yes	14	70.0	0	0.0	0	0.0	

\* Significant at P≤0.05

Table (7): Percentage Distribution of Premature Neonates Regarding Effect of Abdominal Massage on Vomiting.

Vomiting		Control group n=20		Study group before feeding n=20		Study group after feeding n=20		Test of sig
		No	%	No	%	No	%	
1 <sup>st</sup> day	No	16	80.0	17	85.0	16	80.0	X <sup>2</sup> :4.775 P:0.788-
	Yes	4	20.0	3	15.0	4	20.0	
2 <sup>nd</sup> day	No	3	15.0	10	50.0	10	50.0	X <sup>2</sup> :9.775 P:0.03
	Yes	17	85.0	10	50.0	10	50.0	
3 <sup>rd</sup> day	No	9	45.0	14	70.0	13	65.0	X <sup>2</sup> :10.905 *P: <b>0.001</b>
	Yes	11	55.0	6	30.0	7	30.0	
4 <sup>th</sup> day	No	12	60.0	18	90.0	16	80.0	X <sup>2</sup> :11.909 *P: <b>0.00</b>
	Yes	8	40.0	2	10.0	4	20.0	
5 <sup>th</sup> day	No	14	70.0	20	100	20	100	X <sup>2</sup> :12.027 *P: <b>0.000</b>
	Yes	6	30.0	0	0.0	0	0.0	
6 <sup>th</sup> day	No	15	75.0	20	100	20	100	X <sup>2</sup> :14.909 *P: <b>0.000</b>
	Yes	5	25.0	0	0.0	0	0.0	

7 <sup>th</sup> day	No	12	60.0	20	100.0	20.0	100	X <sup>2</sup> :18.047 *P:0.000
	Yes	8	40.0	0	0.0	0	0.0	

Significant at P≤0.05

**Table (8):** Percentage Distribution of Premature Neonates Regarding Effect of Abdominal Massage on Stool Characteristics.

Stool characteristics and consistency		Control group n=20		Study group before feeding n=20		Study group after feeding n=20		Test of sig
		No	%	No	%	No	%	
1 <sup>st</sup> day	Normal	3	15.0	8	40.0	7	35.0	X <sup>2</sup> :18.349 P: 0.085
	Constipation	17	85.0	12	60.0	13	65.0	
	Diarreha	0	0.0	0	0.0	0	0.0	
2 <sup>nd</sup> day	Normal	15	75.0	18	90.0	17	85.0	X <sup>2</sup> :23.225 P: 0.071
	Constipation	5	25.0	2	10.0	3	15.0	
	Diarreha	0	0.0	0	0.0	0	0.0	
3 <sup>rd</sup> day	Normal	6	30.0	18	90.0	17	85.0	X <sup>2</sup> :25.320 *P: 0.000
	Constipation	14	70.0	2	10.0	3	15.0	
	Diarreha	0	0.0	0	0.0	0	0.0	
4 <sup>th</sup> day	Normal	9	45.0	18	90.0	17	85.0	X <sup>2</sup> :33.354 *P: 0.000
	Constipation	9	45.0	2	10.0	3	15.0	
	Diarreha	2	10.0	0	0.0	0	0.0	
5 <sup>th</sup> day	Normal	14	70.0	20	100.0	20	100.0	X <sup>2</sup> :34.878 *P: 0.000
	Constipation	5	25.0	0	0.0	0	0.0	
	Diarreha	1	5.0	0	0.0	0	0.0	
6 <sup>th</sup> day	Normal	10	50.0	20	100.0	20	100.0	X <sup>2</sup> :31.851 *P:<0.000
	Constipation	9	45.0	0	0.0	0	0.0	
	Diarreha	1	5.0	0	0.0	0	0.0	
7 <sup>th</sup> day	Normal	13	65.0	20	100.0	20	100.0	X <sup>2</sup> :35.379 *P:<0.000
	Constipation	7	35.0	0	0.0	0	0.0	
	Diarreha	0	0.0	0	0.0	0	0.0	

Significant at P≤0.05

### V. Discussion

The functional limitation of the GIT among premature neonates such as delayed gastric emptying could hinder their ability to tolerate feeding and consequently their growth will be affected<sup>(22,23)</sup>. NICU is noisy environment with policy of minimal handling to avoid acquired infection<sup>(24)</sup>. According to Fallah et al (2013)<sup>(25)</sup> and Smith (2012)<sup>(26)</sup>, the practice of minimal touch, which is widespread in many neonatal units, also leads to greater deprivation of tactile stimulation. So, providing hospitalized premature neonates with various forms of supplemental stimulation is the main responsibility of the NICU nurses. Abdominal massage can stimulate parasympathetic activity resulting in a GI tract response and reported to be effective in relieving many problems including GIT problems<sup>(27)</sup>. Basically, abdominal massage is not a substitute to the medical and nursing care, but it is an appropriate complementary and integrative treatment<sup>(28)</sup>. Thus, the current study was conducted to determine the effect of abdominal massage therapy on feeding tolerance of premature neonates.

On investigating the premature neonates' characteristics, the present study showed that more than two third of both control and study groups of premature neonates were 30 - < 34 weeks of gestational age. Meanwhile, regarding their birth weight nearly more than two third of both control and study groups premature neonates' their birth weight is 1250- < 1400 g. These results were supported by Bridget C (2012)<sup>(29)</sup> and Badr B



(2011)<sup>(30)</sup> whom emphasized that the birth weight is an indicator for health condition of the neonates. Shah, et al (2011)<sup>(31)</sup> mentioned that the neonate's gestational age and birth weight indicates the adequacy of growth intra uterine, whereas the organ systems maturity depends on gestational age.

It was noticed from the current study that the majority of premature neonates of both the control and study groups received preterm formula milk. This finding could be interpreted in the light of the fact that transporting neonates to distant neonatal intensive care units may cause a delay in the receipt of human milk from their mothers who may still recuperating in the birth hospital or home. Moreover, the result of the present study may be a result of some mothers believes that breast milk is not enough to nourish their neonates or that the low weight of their neonates make them not able to tolerate feeding. This finding is congruent with Ouda (2013)<sup>(32)</sup> who reported that majority of preterm neonates were receiving formula milk only. On the other hand, the finding of the present study is contradicted with the findings of Dollberg et al (2000)<sup>(33)</sup>, who did a study about effect of continuous versus intermittent bolus feeding on gastrointestinal tolerance in LBW neonates, reported that the few percentage of LBW neonates of both study groups were receiving formula milk only.

Minimal enteral nutrition (MEN) (trophic feeds, gut -priming, non-nutritive feeding) has increasingly been used in the early feeding of preterm infants and appears to be well tolerated and beneficial of gut motility and reduced cholestasis but increased risk of NEC<sup>(9, 34, 35)</sup>. There is no general agreement about the optimal timing to start early enteral feeds<sup>(36)</sup>. Feedings should be started within the first days of life as physiologic stability is demonstrated<sup>(37)</sup>. The results of the present study revealed that feeding was initiated in more than half of premature neonates in control and study groups within the average of 2-5 days. This finding is congruent with Ouda (2013)<sup>(32)</sup>, who reported that feeding was initiated for the LBW neonates on intermittent bolus and continuous feeding within the average of 3-4 days with no statistical significant differences between both groups. On the contrary, Rojahn and Lindgren (2001),<sup>(38)</sup> whom reported that early initiation of enteral feeding was within 1<sup>st</sup> 24 hours. And also agreement with Renato et al (2011)<sup>(21)</sup> who stated that delaying the start of enteral feeding results in prolonged parenteral nutrition, and increases the risk of the related complications, such as infections and cholestasis<sup>(39)</sup>.

Time to achieve full enteral feeding is an indicator for gastrointestinal tolerance<sup>(40)</sup>. A delay in reaching full enteral feedings is associated with a poorer mental outcome in preterm neonates<sup>(41)</sup>. The finding of this study revealed that, both of study groups reached to full feeding faster than premature neonates of control group with statistical significant differences and feeding was withheld for both study groups less than for those on control group. These could be explained that abdominal massage improved premature neonates' circulation and increased blood supply of the stomach that accelerates gastric motility, digestion and decrease gastric residual volume in addition to these neonates receive trophic feeding early which promote intestinal maturation<sup>(15)</sup>. This is consistent with the finding of Manju and Shilpi (2014)<sup>(42)</sup> who pointed out that moderate pressure massage can increase gastric motility and better absorption of nutrients and the premature neonates of study group took a shorter and faster time to attain full enteral feedings than the those in control group.

Feeding intolerance is recognized from the presence of gastric residuals that frequently occur among preterm neonates. Sometimes, gastric residuals are benign and relate to decreased GIT motility; however, they also may be an early indication of bowel obstruction, ileus or NEC<sup>(28)</sup>. The results of the current study reflected that there was a decline in the gastric residual volume among premature neonates of the study group and the majority of them had no gastric residual particularly in the last day of massage compared to all preterm neonates of the control group had gastric residual. The decrease in the amount of GRV in the massage groups was found to be statistically significant. This could be attributed to the fact that applying abdominal massage can enhance GIT hormones, may improve the development of the GIT, gut hormone release, gut motility, increase gastric emptying and consequently decrease gastric residual volume<sup>(43)</sup>. The present findings is similar to a study conducted by Tekgündüz1 et al (2014)<sup>(44)</sup> who pointed out that the majority of premature neonates in massage group successfully developed feeding tolerance and decreased gastric residual volume compared to the control group.

Other frequent signs of suspected FI among premature neonates are abdominal distension, vomiting and abnormal stool characteristics. These problems can prolong the need for parenteral nutrition and the length of hospitalization<sup>(45)</sup>. Regarding abdominal distension, it was observed from the results of the present study that the percentage of preterm neonates of the study groups who had abdominal distension decreased dramatically in the day 2 of study period compared to preterm neonates of the control group with high statistical significant differences. This finding may be related to abdominal massage accelerates peristalsis by changing intra-abdominal pressure and creating a mechanical and reflexive effect on the intestines, decreasing abdominal distension and increasing intestinal movements<sup>(46, 47)</sup>. This mechanism causes a significant shortening in the time for colonic passage<sup>(48)</sup>. These results are in harmony with the findings of Tekgündüz1 et al (2014)<sup>(44)</sup>.

Vomiting is the most serious complication associated with enteral feeding, increasing the risk of aspiration and pneumonia<sup>(49)</sup>. On the second day of the study, vomiting was observed in high percent in the control group and half of premature neonates in both study groups, whereas the day 5 of the study all premature

neonates in two massage groups did not have vomiting compared to control group. The decrease in the number of vomiting instances of the premature neonates in the massage groups was determined to be statistically significant. This reduction is an expected result due to the effect of massage in enhancement of digestion which it is manifested by absence of gastric residual among the majority of preterm neonates of the study groups. This result is in line with Ebrahim (2017)<sup>(28)</sup> and Tekgunduz et al (2014)<sup>(44)</sup> who concluded that the difference between first day and last day for the study group regarding number of vomiting episodes was statistically significant. Similarly, Cho et al (2012)<sup>(50)</sup> conducted a study about the effect of meridian massage on physical growth and infants' health as perceived by mothers. They, reported that infants who received acupressure had less regurgitation and vomiting compared to infants who received gentle massage. These results are in agreement with the results of Uysal et al (2012)<sup>(49)</sup> who stated that vomiting was found to be significantly reduced among massage group than control group. On the other hand, the finding of the present study is incongruent with Rose and Watcha (2009)<sup>(51)</sup> who found that acupressure was ineffective in preventing GIT symptoms as nausea or vomiting in pediatric patients.

Constipation is an alteration in the frequency, consistency, or ease of passing stool, may arise secondary to GIT intolerance among premature neonates<sup>(1)</sup>. According to the data obtained on the first day of the study, constipation was observed in majority of the premature neonates in control group, where as it was observed in about two third of premature neonates in the both study groups, this may due to immaturity of the bowel in premature neonates. When the data collected on the last day of massage was analyzed, constipation was not observed in any premature neonates of the study groups. The decrease in the constipation in the massage group was found to be statistically significance. This finding could be justified by the fact that abdominal massage can restore homeostatic balance by a differential effect or, suppressing hyper-function, stimulating hypo-function and regulating disturbed function<sup>(52,53)</sup>. So, they promote gastric peristalsis in children with low initial gastric motility. The finding of the present study is in agreement with Broide et al (2011)<sup>(54)</sup> who found that acupressure was effective measure in increasing frequency of bowel movements gradually among children with constipation. Additionally, Ebrahim (2017)<sup>(28)</sup> reported that stimulation of GIT related acupoints enhanced the regularity of gastric activity which decreased the occurrence of constipation. It also in line with Sinclair (2010)<sup>(55)</sup> who reported that abdominal massage can stimulate peristalsis, decrease colonic transit time, increase the frequency of bowel movements in constipated patients.

## VI. Conclusion & Recommendations

### Conclusion

Based upon the findings of the current study it could be concluded that premature neonates who received abdominal massage therapy exhibited less feeding intolerance criteria as less gastric residual, less abdominal distention, less vomiting and less abnormal defecations compared to premature neonates in control group. Moreover, premature neonates in massage groups take less time to reach full feeding than premature neonates in control.

### Recommendations:

- 1-Combination between medical and routine nursing care of premature neonates and abdominal massage technique should be considered in the policy of the NICU.
- 2-Neonatal intensive care unit nurses should attend training courses regarding massage therapy to gain knowledge about importance of massage and how to practice it effectively.
- 3-Mothers of premature neonates should be trained by a specialist in massage therapy before discharge in order to practice it for their neonates at home.
- 4-Neonatal intensive care unit should offer clear booklets and CDs regarding abdominal massage therapy to help mothers to do it successfully for their neonates.
- 5-Replication of the study for long study period and on large number of premature neonates.

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