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Effect of Massage therapy on Postoperative Pain following Abdominal Surgery in Infants

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Abstract
Pain after abdominal surgery has a significant effect on physiological and psychological aspects of infants. Massage therapy has demonstrated effectiveness in pain relief in randomized trials. **Aim of the study:** To examine the effect of massage therapy on infants' post-operative pain following abdominal surgery. **Subjects and method:** Design: Aquasi –experimental (time series) design was used to conduct this study, sample a random sample of 60 infants were used. **Setting**: The study was conducted at Pediatric Surgery department at Assiut University Children Hospital.**Tools:** Two tools were used to collect data; a structured interview questionnaire and face, leg, activity, crying, consolability scale (FLACC) to assess pain. **Results:** There was statistically significant difference between both groups and during pre-test and post-test regarding FLACC scores. A highly statistically significant difference between study and control group pain score at first, third and fourth visit in post-test (P1=0.000, p1= 0.024 and P1=0.004 respectively). **Conclusion:** Massage therapy has significantly decreased postoperative pain in infants. **Recommendations:** Providing periodically training program for nurses and mothers infants to improve awareness about abdominal pain and used of non-pharmacological methods for pain relief such as massage therapy.

Keywords: Massage therapy, Postoperative Pain, Abdominal Surgery & Infant.

Introduction
Initial misinterpretations of common infant pain outcomes, such as the lack of declarative memory for painful experiences during infancy, the muted responses of premature infants after a barrage of painful procedures, and unacceptable rates of serious adverse events due to poor knowledge of infant responses to analgesics and anesthetics during the 1950s to 1970s, perpetuated widespread neglect of infant pain treatment. **(Slater et al., 2010)**

Established research supports infants' anatomical and functional capacity to perceive pain and respond to tissue insult in a manner interpretable as pain. However, despite significant advocacy work, infant acute pain is still undermanaged or unmanaged. **(Taddio, 2010)**

Pain after abdominal surgery has a significant effect on physiological and psychological aspects of infants. The physiological effect is related to impaired respiration, disturbances in sleep and appetite, and decreased mobility. The psychological effect is associated with emotional responses, such as anger, fear, anxiety and sadness which can be conceptualized as pain distress **(Chanif et al., 2013).**

Pain can be evaluated in terms of self-report, physiological changes or behavioral observation. A physiological indicator of pain is often unreliable but may include tachycardia, restlessness, pallor, vomiting, or blood pressure increases. Various pain scales can be used to help children express their pain, e.g. a visual analogue scale, a graphic rating scale or a numerical rating scale (**Diedericks, 2017)**.

The quality of life experienced by the infants can be greatly reduced regardless of their basic diagnosis. Thus, if pain will be poorly managed, it can reflect the influence on family and caregivers causing increased rates of hospital admission.

A long-term negative effect of untreated pain on pain sensitivity, immune functioning, neurophysiology, attitudes, and health care behavior are supported with numerous evidences. Health care professionals' who care for children are mainly responsible for assuaging pain and suffering. (**Halefom, 2017*).***

The goal of pain management is to reduce pain, distress and anxiety, and the nurse is the key person to help and support the child in pain. **(Mackintosh-Franklin, 2013).** Pain management refers to using the processes of nursing that is assessment, planning, implementation and evaluation in treatment of pain. Unrelieved pain can lead to a number of undesirable physical and psychological consequences **(Noel et al., 2012).**

Pain treatment in infants is often insufficient and less potent analgesics are used compared with those used by adults. There is a tendency to use simple analgesics and to use them later in the course of disease (**Diedericks, 2017).** Poor management of children's postoperative pain could be due to inadequate pain medication and non-pharmacological methods used on pediatric patients.

The use of pain medication is effective in treatment of pain **(Ahola et al., 2012).**

Non-pharmacological pain management is using other methods to manage pain with exemption of drugs. This include: cognitive-behavioral methods, psychological methods, emotional support, physical methods and creation of a comfortable environment **(Wright, 2015).**

Massage therapy is a non-pharmacological nursing intervention that can be used as a complementary therapy in relieving acute postoperative pain in patients after abdominal surgery. Massage therapy involves hands-on and skin-to-skin manipulation of the soft tissue that includes gentle effleurage, light petrissage and compression and nerve stroke. It is thought to work by enhancing vagal activity, modulating insulin and insulin like growth factor 1 as well as decrease levels of cortisol and epinephrine **(Richard et al., 2014).**

Nurse has a role to control and relieve acute postoperative pain by using both pharmacologic and non-pharmacologic approaches. Postoperative pain management with the pharmacologic intervention includes the regular administration of analgesic drugs. Pharmacological management includes non-opioids, opioids and anesthesia **(Chanif et al, 2013).**

Significance of the study

Massage therapy has demonstrated effectiveness in pain relief in randomized trials. Massage therapy decreased pain scores in 13 infants receiving heel sticks preceded by a 2-minute massage in the bilateral leg. **(Jain & McMillan, 2006).** Massage therapy is considered a safe practice and there are no significant harmful effects if performed appropriately. So, it is important to focus on the effect of massage therapy on reducing infant's post-operative pain following abdominal surgery **(Kulkarni, 2010).**

Aim of the study

This study aimed to examine the effect of massage therapy on infants' post-operative pain following abdominal surgery in Assiut University Children's Hospital.

Research hypothesis

Infants who receive massage therapy exhibited to be improved or have less pain than have routine hospital care.

Subjects & Method

Research design

A quasi experimental (time series design) was used to conduct this study.

A-Setting

This study was conducted in Pediatric Surgery department at Assiut University Children Hospital.

B –Sample

The study included a convenient sample of 60 infants with abdominal surgery.

Exclusion criteria

1- Chronic diseases.
2- Preterm infants.
3- Nervous system dysfunction such as epilepsy.

This study was classified into two groups. The first group (study group) (30) infants' who received massage and routine hospital care. The second group (control group) (30) infants' who received routine hospital care only.

C-Tools of the study

After reviewing the relevant literature, two tools were utilized to collect data pertinent to study.

Tool one: -A structured questionnaire developed by the researcher. It includes three parts:-

Part 1

Socio-Demographic data such as: Age, sex, weight, birth order, mothers' education and occupation.

Part 2

Clinical data such as: Diagnosis, date of surgery, type of operation, type of anesthesia and medical illness.

Part 3

"**Vital signs sheet**"

It was developed by researcher to assess the effect of massage on the vital signs and consists of measuring heart rate, respiratory rate, and temperature before and after massage therapy sessions for study group.

Tool two: The Face, Leg, Activity, Cry, Consolability(FLACC scale)

The FLACC scale was developed by **(Merkel et al., 1997)** to assess post-operative pain in children aged 2 months to 7 years or individuals that are unable to communicate their pain. It incorporates five categories of behavior, each scored on 0–2-point scale so that the total score ranges from 0 to 10. Total scores of 0 indicates no pain, 1-3 means mild, 4-6 indicates moderate, and 7-10 is severe pain.

In infants who are awake: observe for 1 to 5 minutes or longer. Observe facial expression legs and body uncovered. Reposition infants or observe activity. Assess body for tenseness and tone. Initiate consoling interventions if needed.

In infants who are asleep: observe for 5 minutes or longer. Observe body and legs uncovered. If possible, reposition the infants. Touch the body and assess for tenseness and tone.

Face

- **Score 0** if the infant has a relaxed face, makes eye contact, shows interest in surroundings.
- **Score 1** if the infant has a worried facial expression, with eyebrows lowered, eyes partially closed, cheeks raised, mouth pursed.
- **Score 2** if the infant has deep furrows in the forehead, closed eyes, an open mouth, deep lines around nose and lips.

Legs

- **Score 0** if the muscle tone and motion in the limbs are normal.
- **Score 1** if infant has increased tone, rigidity, or tension; if there is intermittent flexion or extension of the limbs.
- **Score 2** if infant has hypertonicity, the legs are pulled tight, and there is exaggerated flexion or extension of the limbs and tremors.

Activity

- **Score 0** if the infant moves easily and freely, normal activity or restrictions.
- **Score 1** if the infant shifts positions, appears hesitant to move, demonstrates guarding, a tense torso, pressure on a body part.
- **Score 2** if the infant is in a fixed position, rocking; demonstrates side-to-side head movement or rubbing of a body part.

Cry

- **Score 0** if the infant has no cry or moan, awake or asleep.
- **Score 1** if the infant has occasional moans, cries, whimpers, sighs.
- **Score 2** if the infant has frequent or continuous moans, cries, grunts.

Consolability

- **Score 0** if the infant is calm and does not require consoling.
- **Score 1** if the infant responds to comfort by touching or talking in 30 seconds to 1 minute.
- **Score 2** if the infant requires constant comforting or is inconsolable **(Merkel et al., 1997).**

D-Methodology

Administrative phase

An official letter of approval obtained from the Dean of Faculty of Nursing- Assiut University was sent to the Head of Pediatric Surgical Department at Assuit University Hospital to carry out the study. That letter included explanation of the purpose and nature of the research and permission to collect the necessary data.

A pilot study was carried out before starting of data collection. It was done on (6) infants to identify feasibility and applicability of the tools used and they no modification were included in the study sample.

1. Internal consistency of reliability was assessed for tool one by Alpha cronbach test and it was 0.82.
2. Validity of tools was done bya jure of five experts in Pediatric Nursing and Content Validity Index (CVI) was0.87 and 0.79 for tool I and tool Π respectively.
3. Reliability of tool two was assessed in previous studies, include **Lewis, et al., (2010)** who reported a reliability of r= 88%.
4. Pain was assessed during pre and post- test intervention by researcher and used in the two groups 4 times; First visit (first day of operation), Second visit (second day of operation during morning shift), Third visit (second day of operation during afternoon shift and fourth visit (third day of operation during morning shift.

III- Data collection Phase

Filed of the work

- The researcher interviewed each of infants individually at the pediatric surgery department at Assuit University Children Hospital to obtain the necessary information.
- The studied subjects fulfilling the research criteria were assigned randomly into two groups (study and control groups).
- Data were collected in the period from December 2016 to end of July 2017; about 2-3 participants through two days weekly. The purpose of the study was explained to the participants prior to answering the question.
- Interview questionnaire sheet was filled by the researcher herself and all the included in parties was explained to mothers.
- The sheet required 15-20 minutes to be filled.

Progressive massage therapy technique developed by (Beider Set al., 2007)

It is a form of physical non-pharmacological methods used to reduce postoperative pain. It consists of gently rubbing the infant with the nurse palms for 5 minute period (12 strokes at every minute, approximately one rubbing motion every five seconds) over each region in the following consequence

- From the infant s head and face to the neck.
- From the neck across the shoulders.
- From the thigh to the foot to the thigh on both legs.
- From the shoulder to the hand to the shoulder on both arms.
- Hold the infant in upright position and stroke him from the upper back to the waist.

- Massage technique was implemented for 5 minutes twice daily starting from the first postoperative day for two consecutive days. One time at the morning shift and another time at the afternoon shift.
  I received training about massage from the physical therapist.
- The severity of pain was measured before and after half –an-hour of massage for the study group, before and after half – an- hour of routine care for the control group through the two studied days.

IV- Ethical considerations

1. Research proposal was approved from Ethical Committee in the Faculty of Nursing- Assiut University.
2. There is no risk for study subjects during application of the research.
3. The study followed common ethical principles in clinical research.
4. Written consent was obtained from infants' care givers or guidance who participated in the study, after explaining the nature and purpose the study.
5. Confidentiality and anonymity were assured.
6. Infants' care givers have the right to refuse to participate and or withdraw from the study without any rational any time.

IIV- Statistical Analysis

- The data obtained were reviewed, prepared for computer entry, coded, analyzed and tabulated. Descriptive statistics (i.e., frequencies, percentage, mean standard deviation, T-test, chi - square.) were done by using software of statistical package of social sciences (SPSS) Version 11.T-test was used for comparison of two means, it is considered significant when $P<0.05$.

Results

Table (1): Socio-demographic characteristics of the studied subjects.

	Study (n= 30)		Control (n= 30)		X^2	P-value
	No.	%	No.	%		
Age: (months)						
2 – 6	21	70.0	16	53.3	1.76	0.184
7 – 12	9	30.0	14	46.7		
Sex						
Male	18	60.0	20	66.7	0.29	0.592
Female	12	40.0	10	33.3		
Weight						
Mean ± SD	5.52 ± 1.98		6.33 ± 2.73		--	0.388
Range	3.0 – 10.0		3.0 – 11.0			
Birth order						
First	14	46.7	15	50.0	0.07	0.796
Second or more	16	53.3	15	50.0		
Mothers' educational level						
Illiterate or read and write	10	33.3	7	23.3	0.74	0.390
Basic education	4	13.3	6	20.0	0.48	0.488
Secondary or Diploma	8	26.7	10	33.3	0.32	0.573
University or higher	8	26.7	7	23.3	0.09	0.766
Mothers' occupation						
Working	11	36.7	16	53.3	1.68	0.194
Housewife	19	63.3	14	46.7	1.68	0.194

Table (2): Mean FLACC score among study and control groups before and after the intervention.

	FLACC score	Study (n= 30)	Control (n= 30)	P- value1
		Mean ± SD	Mean ± SD	
***First visit**	Pre-test	7.83 ± 1.23	7.47 ± 2.24	0.975
	Post-test	5.63 ± 1.10	7.43 ± 2.37	0.000*
	P-value²	0.000*	0.892	
****Second visit.**	Pre-test	7.70 ± 1.12	6.33 ± 2.32	0.017*
	Post-test	4.23 ± 1.17	5.37 ± 2.53	0.024*
	P-value²	0.000*	0.001*	
*****Third visit.**	Pre-test	7.03 ± 1.19	4.80 ± 2.93	0.003*
	Post-test	2.97 ± 1.38	3.30 ± 2.55	0.541
	P-value²	0.000*	0.000*	
******Fourth visit.**	Pre-test	6.00 ± 1.53	3.77 ± 3.10	0.004*
	Post-test	0.90 ± 1.18	2.27 ± 2.27	0.004*
	P-value²	0.000*	0.003*	

i. ***First visit: - after 6 hours of operation (first day of operation).*
ii. ****Second visit: - second day of operation during morning shift.*
iii. *****Third visit: - second day of operation during afternoon shift.*
iv. ******Fourth visit:- third day of operation during morning shift.*
v. *P-value 1: relation between study group and control group.*
vi. *P-value 2: relation between pre-test and post-test.*

Table (3): Distribution of studied subjects regarding Post-operative analgesic medication.

	Study (n= 30)		Control (n= 30)		P-value
	No.	%	No.	%	
Medications (analgesics)					0.688
Epoctil	3	10.0	4	13.3	
Perfelgan	27	90.0	26	86.7	
Route of administration					0.640
IM	2	6.7	3	10.0	
IV	28	93.3	27	90.0	
Dose of medication /ml					0.049*
Mean ± SD	9.22 ± 4.14		11.61 ± 4.97		
Range	4.5 - 20.0		4.0 - 20.0		

Table (4): relation between socio-demographic data and FLACC score post intervention at third visit.

	%	FLACC score Post3		P-value
		Mean ± SD (No= 30)	Median (Range) (No= 30)	
Age: (months)				0.047*
2 – 6	70.0	2.67 ± 1.28	3.0 (0.0-5.0)	
7 – 12	30.0	3.67 ± 1.41	4.0 (1.0-6.0)	
Sex:				0.110
Male	60.0	3.22 ± 1.22	4.0 (0.0-5.0)	
Female	40.0	2.58 ± 1.56	3.0 (0.0-6.0)	
Birth order				0.983
First	46.7	3.00 ± 1.18	3.0 (1.0-5.0)	
Not	53.3	2.94 ± 1.57	3.0 (0.0-6.0)	

	%	FLACC score Post3		P-value
		Mean ± SD (No= 30)	Median (Range) (No= 30)	
Diagnosis				
Acquired defect	76.7	4.00 ± 1.00	4.0 (3.0-6.0)	0.008*
Congenital defect	93.3	2.52 ± 1.29	3.0 (0.0-4.0)	
Educational level				
Illiterate or Read & write	33.3	4.25 ± 1.26	4.0 (3.0-6.0)	0.211
Basic education	13.3	2.25 ± 1.49	4.0 (1.0-4.0)	
Secondary or diploma	26.7	2.75 ± 1.28	3.0 (0.0-4.0)	
University or higher	26.7		2.5 (1.0-5.0)	
Occupation		3.21 ± 1.36		
Housewife	63.3	2.55 ± 1.37	4.0 (0.0-6.0)	0.148
Employer	36.7		3.0 (0.0-5.0)	

**means significance*

Table (5): relation between socio-demographic characteristics and FLACC score post intervention at fourth visit.

Item	%	FLACC score Post4		P-value
		Mean ± SD No= 30)(	Median (Range) (No= 30)	
Age: (months)				
2 – 6	70.0	0.52 ± 0.75	0.0 (0.0-2.0)	0.014*
7 – 12	30.0	1.78 ± 1.56	2.0 (0.0-5.0)	
Sex				
Male	60.0	0.72 ± 0.96	0.0 (0.0-3.0)	0.423
Female	40.0	1.17 ± 1.47	1.0 (0.0-5.0)	
Birth order				
First	46.7	0.71 ± 0.99	0.0 (0.0-3.0)	0.472
Not	35.3	1.06 ± 1.34	1.0 (0.0-5.0)	
Diagnosis				
Acquired defect	76.7	1.22 ± 1.64	1.0 (0.0-5.0)	0.574
Congenital defect	93.3	0.76 ± 0.94	0.0 (0.0-3.0)	
Educational level				
Illiterate or Read & write	33.3	3.00 ± 1.41	2.5 (2.0-5.0)	0.006*
Basic education	13.3	1.25 ± 0.96	1.5 (0.0-2.0)	
Secondary or diploma	26.7	0.25 ± 0.46	0.0 (0.0-1.0)	
University	26.7	0.38 ± 0.74	0.0 (0.0-2.0)	
Mothers' occupation				
Housewife	63.3	1.26 ± 1.28	1.0 (0.0-5.0)	0.012*
Employer	36.7	0.27 ± 0.65	0.0 (0.0-2.0)	

Table (1): It was shown from the table that the two groups (study and control) groups were matchable before the intervention regarding socio-demographic characteristics. It shows that the majority of infants of both study and control groups aged between 2-6 months, and more than two thirds of both groups were males (60.0%, 66.7% respectively), also the mean weight of infants in the study group was 5.52 ± 1.98 kg as compared to 6.33 ± 2.73 for the control group. Regarding level of mothers' education, one third (33.3%) of mothers of the study group were illiterate, read & write, while one third of mothers in the control group (33.3%) had secondary education. Regarding mothers' working condition, 63.3% of

them were housewives in the study group versus 46.7% in the control group.

Table (2): Comparison between pre-test and post-test in study and control groups regarding FLACC scores. it is shown from the table that highly statistically significant differences between study and control groups in the first, third and fourth visits in post-test at (P1=0.000, P1=0.024 and P1=0.004 respectively).

The table also reveals that, all FLACC scores for studied subjects were high statistical significant differences between pre-test and post-test, in all visits at (P2=0.000).

Table (3): This table illustrates studied subjects regarding post-operative analgesia. It shows statistically significant difference between study and control groups regarding mean dose of analgesia with study group infants consume little dose of analgesic medication than the control group at p-value **(**0.049).

Table (4): shows relation between socio-demographic characteristics and FLACC score. It shows that, there is statistically significant relation between socio- demographic (age and diagnosis) and FLACC score with younger infants and those with congenital defects suffered little pain p- value 0.047 and 0.008 respectively post intervention at third visit.

Table (5): Shows relation between socio-demographic characteristics and FLACC score. It shows that, there is statistically significant relation between socio- demographic (age mother's education and occupation) and FLACC score with younger infants and those with educated and housewife mothers suffered little pain p- value 0.014, 0.006 and 0.012 respectively post intervention at fourth visit.

Discussion

Postoperative pain is very common and develops naturally as a warning symptom. After surgery, its development can be predicted and should be prevented and treated. Pain after abdominal surgery has a significant effect on physiological and psychological aspects of infants **(Chanif, 2013).**

This study found a significant reduction of mean pain score among infants in the massage group compared with their pre massage rating (5.63 ± 1.10 vs 7.83 ± 1.23) p-value, 0.000. Moreover, the present study revealed a significant improvement in pain score in the massage group compared to the control group (5.63 ± 1.10 vs. 7.43 ± 2.37) P-value, 0.000.

This result is in accordance with **(Suresh et al., 2008)** who reported that pediatric patients reported highly significant improvement in their level of distress, pain and discomfort compared with their pre massage pain scores.

This finding parallel with **(Ibrahim et al., 2016)** who found Pain mean score was significantly higher in no massage than massaged group. Majority of preterm infants who received massage had moderate pain during and after heel stick while all preterm infants who did not receive massage had severe pain during and after heel stick.

Also, it is in agreement with the result of **(Adamset al., 2010)** who found that 20 minutes of massage intervention significantly reduced postoperative pain intensity levels within the first and second hour.

The preceding finding was also supported by **(Mirzarahimi et al., 2013)** in his study about "Effect of leg massage on physiological and behavioral indicators of pain following heel blood sampling in term neonates" and documented that massage and no massage babies had no pain prior to heel stick, while sever pain in the no massage during and after heel stick and moderate pain in the massage group were recorded.

This result is consistence with **(Huang& Huang, 2014**) who found that massage has soothing effects on pain of vaccination.

Surgical nurses have a key role in the care of pediatric patients with pain, and because they spend much time with pediatric patients. Hence they can use non-drug methods such as music therapy and massage, help to control pain after surgery **(Miladinia et al., 2016).**

However, **(Stave ski et al., 2018)** reported that no significance difference in pain score in the initial 24 hours after heart surgery and within 48hours of transfer to the acute care unit.

Massage also reduces the dose of analgesic used in infants postoperatively. The present study found a significant reduction in the dose of analgesic used in the study group compared to that of the control group (table 3).This result is in agreement with that of **(Staveski et al., 2018)** who found that, children receiving massage therapy had significantly lower total benzodiazepine exposure in the immediate three days following heart surgery. However, they also found no difference in total opioid exposure during the first three postoperative days between groups.

The current study found no significant relation between socio demographic data and FLACC score post intervention at first visit (after six hours of operation)and second visit (second day of operation at morning shift).

However, a significant relation was found between age and FLACC score of pain in the third visit

(second day of operation at afternoon shift) with infants 2-6 months experienced less pain than older infants (7-12months).

This may be interpreted by the fact that little infant perceive pain less than younger infants **(Rittger et al., 2011).**

Moreover, a significant relation was found between diagnosis and FLACC pain score with infants who had congenital defects perceive little pain. This may be because of the higher rate of congenital defects among infants less than 6 months of age.

Our study found a significant relation between age and FLACC pain score in the fourth visit (third day postoperative) with little infants perceived less pain than older infant.

This may be interpreted that young infants 'perception of pain was less than that of older infant

Moreover, infants of educated mothers showed little pain score than those of illiterate mothers. This is apparent in this study in the significant relation between mothers' educational level and FLACC pain score with those infants with educated mothers had less pain score than those of illiterate mothers.

This can be explained as educated mothers are keen on performing massage accurately and precisely for their infants. Moreover, compliance on massage of educated mothers maybe better than non-educated or illiterate mothers.

Massage may activate descending endogenous opioid and non-opioid pathways to decrease nociceptive transmission and reduce pain, and/or alter other natural pain killers such as serotonin and substance P. Massage may also contribute to a soothing environment similar to studies of multisensory stimulation potentiating the analgesics effects **(Franck, & Lawhon, 2014).**

Conclusion

The present study was concluded that, infants who were exposed to massage therapy had experienced lower intensity of postoperative pain compared to infants in the control group who received routine hospital care.

Recommendations

In the light of the findings obtained from the current study the following recommendations were suggested

- In service education programs are needed to upgrade nurse's knowledge and performance on the management of postoperative pain following abdominal surgery in infants.
- Massage therapy should be considered as a part of routine nursing care of infants following abdominal surgery.
- Scientifically established protocols of care for postoperative pain following abdominal surgery in infants should be designed and established by experts in pediatric professors and pediatric nursing staff.

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