

## Effect of Massage therapy on sleep disturbances and pain control for children post abdominal surgeries

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### Abstract

**Background:** Abdominal surgeries are considered to be one of the most painful surgical procedures which defined as surgery pertaining to the content of the abdominal cavity. Massage therapy is a technique that promotes the manual mobilization of several structures from both muscle and subcutaneous tissue, **The study was aimed** to determine the effect of massage therapy on sleep disturbances and pain control for children post abdominal surgeries. **Subjects and method:** Purposive sampling of 60 children post abdominal surgeries participated in the present study divided into two equal groups study and control group. The study was conducted at the Pediatric Surgical Department of Tanta University Hospital. **Four tools** were used for data collection: structured interview schedule for socio-demographic characteristics of the children, sleep diaries, assessment for sleep disturbances scale for children, physiological measurement, pain assessment by using numerical rating scale, and FLACC behavioral pain assessment scale. **The results** showed children in the study group significantly improved of sleep disturbances and physiological measurement decreased pain level after implementing massage therapy postoperatively **Conclusions:** The difference was statistically significant after implementing massage therapy in the study group than control group. **The study recommended** that ongoing in-service education programs must be designed and implemented for nurses about massage therapy. Future studies are suggested with increased sample sizes, a longer interventional period duration, and an objective measure of sleep.

### Keywords:

Children, Massage therapy, Pain control, Post abdominal surgeries, Sleep disturbances.

### Introduction

Abdominal surgery is considered to be one of the most painful surgical procedures which defined as surgery pertaining to the contents of the abdominal cavity, its walls and orifices. Abdominal surgeries take place in the area between the first rib and the pelvic floor and can be performed on a variety of abdominal organs, such as the reproductive organs, stomach, gallbladder, intestine, appendix, liver, spleen or esophagus. <sup>(1,2)</sup>

According to the National Center for Health Statistics Analysis the (2005- 2018) 48 million surgical procedures performed worldwide and amongst 3.9 million are abdominal surgeries. The number of children in need of abdominal surgery has increased during the last 10 years, leading to higher rates of these surgical procedures. Abdominal surgical procedure is one of the most common surgical procedures in Europe and the United States. <sup>(3,4)</sup>

Postoperative sleep disturbances are featured by insomnia hypersomnia changed sleep structure and increased frequency waking. Postoperative sleep disturbances caused by general anesthesia might increase the incidence of postoperative complications such as postoperative fatigue. <sup>(5,6)</sup>

Sleep disturbance was common among children undergoing surgery, especially during the first week of the postoperative period, which was partly due to disturbed melatonin secretion in the perioperative period. It seemed that modifying the melatonin level by adding exogenous melatonin to the natural circadian hormone could result in the amelioration of sleep disturbance. <sup>(7,8)</sup>

Sleep disturbances was found after major surgical procedures. The duration of the operative procedure was related to the duration of postoperative sleep disturbance, probably as a result of more extensive surgical trauma and a serious condition for child. This is associated with the inflammatory reaction, sympathetic nervous excitement, and endocrine disturbance caused by surgical trauma, the increase of cytokines, cortisol and catecholamine and the decrease of melatonin level in the body after surgery. <sup>(9,10)</sup>

Pain can prolong the sleep latency and reduce the total sleep time, while sleep disturbances can increase pain sensitivity and decrease the pain threshold; even the pain severity in the next day can be predicted with the postoperative sleep quality. <sup>(11)</sup>

However, relatively less is known about the short and long-term recovery of children after surgery. Children often continue to report pain for months

following surgery, and emerging research suggests that pain may persist longer-term for many children. <sup>(12)</sup>

The prevalence of post-operative pain is still high. For instance, about 41% of postoperative children experienced moderate to severe pain, even though sedative drugs had been administered. A large survey reported that of 300 children 86% experienced postoperative pain; of which 75% had moderate/severe pain during the immediate postsurgical period. Although about 88% received pain medications 80% of them experienced adverse effects and 39% reported moderate/severe pain even after receiving it. <sup>(13,14)</sup>

Pain after abdominal surgery will limits the physical functioning including the ability to cough, deep breath, move, sleep, loss of appetite and self-care activities. Uncontrolled pain promotes a fight or flight reaction. This reaction tends to delay wound healing and increases the complication rate including infection. <sup>(15)</sup>

Non-pharmacological pain management is using other methods to manage pain with exemption of drugs. This includes: cognitive-behavioral methods, psychological methods, emotional support, physical methods and creation of a comfortable environment. <sup>(16)</sup>

Massage therapy is a non-pharmacological nursing intervention that can be used as a complementary therapy in relieving acute postoperative pain in children 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 as well as decrease levels of cortisol and epinephrine.<sup>(17)</sup>

Nurse plays an important role to assist the child and their parents when using the massage technique in order to make sure that they are using the technique correctly. Nurses must be able to adequately assess sleep pattern severity, understand how to monitor physiologic changes associated with sleep pattern and its treatment, they may be prepared to address the psychosocial experiences accompanying sleep pattern. It is important for nurses to be aware of relevant research-evidence-based guidelines that available to guide them in sleep assessments and management.<sup>(18)</sup>

#### **Aim of the study**

**The study was aimed to:** -Determine the effect of massage therapy on sleep disturbances and pain control for children post abdominal surgeries.

#### **Research Hypothesis: -**

- 1- Implementation of massage therapy is expected to improve sleep disturbances.
- 2-Pain of children post abdominal surgeries is expect to control after implementing massage therapy.

#### **Subjects and Method**

##### **Research Design:**

A quasi-experimental research design was used in the present study.

##### **Setting:**

The study was conducted at the Pediatric Surgical Department of Tanta main University Hospital which is affiliated to Ministry of Higher Education and Scientific Research.

##### **Subjects:**

Purposive sampling of sixty children post abdominal surgeries who were attended at the previously mention setting. The sample

was divided into two equal groups, study and control group (30 children for each).

- 1-Study group was received massage therapy and monitoring vital signs and prescribed medication including analgesic.
- 2-Control group was received daily care, monitoring vital signs and prescribed medication including analgesic.

The sample size was based on the following parameters confidence level error level 5% type I error 0.05 and power of test 95%.

#### **Inclusion criteria of children:**

Age ranged from 3-8 years.

Both sexes.

Post abdominal surgeries.

Free from any complications or contraindication for massage therapy.

#### **Exclusion criteria:**

- Children with irritant skin condition.
- Febrile convulsions.

#### **Tools of data collection:**

##### **Tool I: Structured interview schedule: -**

##### **Part (1): Socio-demographic characteristics of the children:**

Such as age, sex, academic year, date of admission, medical and surgical history will be taken.

##### **Part (2): Sleep diaries: -**

Sleep/wake rhythms of the children will be monitored. The total sleep duration will be measured by the sum of night time and day time sleeping (sleeping hours in bed per 24 hours), and how long after going to bed. Sleep diaries will be filled out for 72 hours pre and post-surgery (Huang et al., 2011).<sup>(19)</sup>

##### **Tool (II): Assessment for Sleep Disturbances Scale for Children (SDCS) by using observation checklists:**

Sleep disturbance Scale for Children indicates disturbance, sleep behavior of the child. It will be used pre and post-operative

for both study and control group. (Huang et al., 2011) <sup>(19)</sup>. The researchers will complete the scale by rating each item from 1 to 5 on a five-point intensity scale.

Total score of the five sleep disturbance subscales will be calculated including:

- Disorders of initiating and maintaining sleep.
- Sleep breathing disorders.
- Disorders of arousal, sleep/wake transition disorders.
- Disorders of excessive somnolence (DES)
- Sleep hyperhidrosis, night sweating.

After summing the different subscale scores of SDSC, the values will be combining into percentiles to obtain the total score indicating a sleep profile of each child.

**The total score will be divided into three categories as the following:**

- Normal ----- less than 50%.
- Borderline ----- 50-70%.
- Clinically significant -- more than 70%.

**Tool III: Physiological measurement:**

Physiological indicators will be used to measure the response of children to pain through measuring heart rate, respiratory rate, and oxygen saturation rate. It will be measured for both study, and control groups pre and post massage therapy 6 hours.

**Tool IV: Part (1): Pain assessment by using Numerical rating scale developed by Young, Farrar (2001) <sup>(20)</sup>** to assess post-operative pain intensity, this scale line number from zero -10 assign number from 0-10 which zero mean no pain and 10 mean severe pain.

Scoring system of pain rating scale is:

- Zero allocated no pain.
- From 1-3 allocated mild pain.
- From 4-6 allocated Moderate pain score.

-From 7-10 allocated severe pain score.

**Part (2): FLACC behavioral pain assessment scale it will be adopted by Kyle, Carman (2013) <sup>(21)</sup>**. It will be used for assessing behavioral responses of children toward post-operative pain. It will be demonstrated to be a reliable scale for children from age 2 month to 7 years of age. It contained five items that are related to facial expression, legs, activity, cry/ vocalization and consolability.

**Scoring system:**

Each category on a scale scored from 0-2 resulting in a total score of 10

**Scoring of pain response:**

- Relaxation and comfortable was scored zero.
- Mild pain from 1-3.
- Moderate pain from 4-6.
- Severe pain from 7-10.

**Method**

**1- Administrative process: -**

Official permission to conduct the study was obtained from the director of pediatric surgical department to carry out the study, obtain their approval and cooperation during the study.

**2-Ethical and legal considerations: -**

- a-Ethical committee approval was obtained
- b-The nature of the study would not cause any harm or pain to the entire subjects.
- c-Informed consent was obtained from mothers to participate in the study after explaining the aim of the stud and their right to withdraw from the study at any time without providing a reason
- d- Children were informed about the confidentiality of their information and it was used only for the purpose of the study.

**3- Tools Development:** were developed by the researcher after reviewing recent related literature

**4- Content validity**

The tools were presented to a jury of five experts in the field of paediatrics nursing to check content validity clarity, relevance, comprehensiveness, understanding, applicability, and ease for implementation, the content validity index was 98.0%.

**5- Reliability** of the developed tools used was tested through internal consistency. The value of Cronbach's alpha coefficient was 0.889

#### **6-A Pilot study:**

A pilot study was carried out before starting the data collection. It was done on a sample of 10% of the children to test clarity, visibility, and applicability of the study tools. This pilot was excluded from the study

#### **Phases of the study**

The study was calculated through four phases.

#### **1-Assessment phase**

The researcher met nurses to explain the purpose and the educational intervention of the study to gain their cooperation after taking permission from related authorities. During the initial interview, the purpose of the study and the procedures were explained and informed consent participants.

The subjects were assured that all information would be confidential to assure the privacy of the participants. The studied sample was interviewed by the researcher and their mother or caregiver. were asked about socio-demographic of the children, Sleep/wake rhythms of the children (tool I) Afterward, the researcher asked the mother about disturbance in the sleep behaviour of the child (tool II). Children of both groups was assessed for physiological parameter and assessed for pain rating scales (Tool III, IV).

#### **2- Planning phase:**

The researcher described to mothers the massage therapy technique to facilitate the mothers understand based on literature review according to mothers' education needs and expected outcomes criteria were formulated.

#### **3- Implementation phase:**

The researcher was implemented the massage therapy technique for the study group 6 hours post abdominal surgeries in a series of three sessions; these was taken three days in the morning by rubbing gently the body parts and stroke it for fifteen minutes in a rhythm, almost 5 movements per minute.

#### **Children are massage for five minutes as follows:**

From the top of the head to neck and back to top of the head and back to neck. From neck to across the shoulder. From the upper back to the waist and back to upper back. From the thigh to foot to the thigh on both legs. From the shoulder to hand to shoulder on both arms. Reassessment of sleep according to sleep disturbance scale for children after massage therapy. Pain intensity was measured by using numerical rating scale after implementing procedure massage therapy for children post abdominal surgeries for study and control group. Behavioural pain scale was assessed after implementing procedure massage therapy for children post abdominal surgeries for both groups. Monitoring vital signs for study and control group

#### **4- Evaluation phase:**

Evaluate the effect of massage therapy on sleep disturbances and pain control for children post abdominal surgeries and compare them with control group who was received daily care ; monitoring vital signs and prescribed medication including

analgesic by using the three tools post-operative three days.

### Statistical analysis

The collected data were organized, tabulated, and statistically analyzed using SPSS software (Statistical Package for the Social Sciences, version 26, SPSS Inc. Chicago, IL, USA). For quantitative data, the range, mean, and standard deviation were calculated. For qualitative data, a comparison between two groups and more was done using Chi-square test ( $\chi^2$ ) and Fisher's exact test. For comparison between means of two groups of parametric data of independent samples t-test was used. Correlation between variables was evaluated using Pearson's correlation coefficient (r). Significance was adopted at  $p < 0.05$ , highly significance was adopted at  $p < 0.01$  for the interpretation of results of tests of significance<sup>(22)</sup>.

### Results

**Table (1):** shows studied children according to their socio-demographic characteristics It was observed that more than half (53.3%) of control group their age ranged from 3 – 5 years with a mean of  $5.336 \pm 1.920$  years, while 60.0% of study group their age ranged from 6 – 8 years with a mean of  $5.766 \pm 1.832$ , Two thirds (66.7%) and (63.3%) of control and study groups were male respectively.

Regarding to diagnosis, nearly one third of control group (40%) and 36.6% of study group respectively had umbilical hernia, more than one quarter (26.7%) of study group and 13.4% of control group had appendectomy. Related to medical history, most of control and study groups (83.3%) had no medical history. There was no statistically significant difference between control and study group.

**Figure (1) Illustrate** studied children according to sleep/wake rhythms before and after surgery. It was noticed that less than half (43.3%) and (40.0%) of the control and study groups respectively sleep 10 hours before surgery with a mean of  $9.200 \pm 1.242$  and  $8.933 \pm 1.142$  hours respectively. Post-surgery and before doing massage therapy, two thirds (66.7%) and (63.3%) of the control and study groups sleep 6 hours with a mean of  $5.466 \pm 1.041$  and  $4.00 \pm 1.069$  hours respectively. Post-surgery after doing massage therapy, two thirds (66.7%) of the control group sleep 6 hours with a mean of  $5.466 \pm 1.041$  hours, while less than half (43.3%) of study groups sleep 10 hours with a mean of  $8.866 \pm 1.634$  hours. There was no statistically significant difference between control and study group before surgery and after surgery before doing massage therapy ( $P = 0.391$  and  $0.808$ ) respectively, while there was highly statistically significant difference between control and study group post-surgery and after doing massage therapy. ( $P = 0.0001$ )

**Figure (2): Shows studied** children according to assessment for sleep disturbances before and after surgery. It was observed that the mean score was  $41.033 \pm 4.106$  and  $41.033 \pm 4.894$  of control and study groups respectively before surgery.

The mean score was  $91.866 \pm 4.439$  and  $93.000 \pm 3.787$  of control and study groups respectively post-surgery before doing massage therapy, with no statistically significant difference.

The mean score was  $91.866 \pm 4.439$  and  $51.133 \pm 4.407$  of control and study groups respectively post-surgery after doing massage therapy, with a highly statistically significant difference ( $P = 0.0001$ ).

**Figure (3): Shows studied** children according to physiological measurement regarding heart rate of the children before and after abdominal surgeries and post-surgery after message. The mean score was  $82.500 \pm 5.575$  and  $80.166 \pm 6.858$  beats/min of control and study groups respectively after surgery before doing massage therapy, with no statistically significant difference while ( $P= 0.154$ ). The mean score was  $92.6 \pm 12.03$  and  $82.7 \pm 9.91$  beats/min of control and study groups respectively post-surgery after doing massage therapy, with a highly statistically significant difference while ( $P= 0.001$ ).

**Figure (4): Shows mean score of pain** among the studied children after surgery. The mean score was  $7.566 \pm 1.735$  and  $7.500 \pm 1.852$  of control and study groups respectively post-surgery before doing massage therapy, with no statistically significant difference while ( $P= 0.886$ ). The mean score was  $7.566 \pm 1.735$  and  $1.300 \pm 1.235$  of control and study groups respectively post surgery after doing massage therapy, with a highly statistically significant difference while ( $P= 0.0001$ ).

**Figure (5): Shows mean score of FLACC** behavioral pain scale of the studied children after surgery. The mean score was  $7.500 \pm 1.613$  and  $7.733 \pm 1.680$  of control and study groups respectively after surgery before doing massage therapy, with no statistically significant difference while ( $P= 0.585$ ). The mean score was  $7.500 \pm$

$1.613$  and  $1.466 \pm 1.041$  of control and study groups respectively post-surgery after doing massage therapy, with a highly statistically significant difference while ( $P= 0.0001$ ).

**Table (2): Shows correlation** between sleep diaries, sleep disturbances scale, and physiological measurement for control group before surgery. It was noticed that there was a highly statistically significant correlation between Sleep Disturbances and respiratory rate ( $P= 0.006$ ).

**Table (3): Shows correlation** between sleep diaries, sleep disturbances, physiological measurement, and pain scales for study group post-surgery after massage. It was found that there was statistically significant correlation between Numerical and Face rating scale and Sleep Disturbances Scale, heart rate and respiratory rate while ( $P= 0.008, 0.009$  and  $0.0001$ ) respectively. Also, found that there was statistically significant correlation between FLACC scale and heart rate while ( $P=0.044$ ). There was a positive statistically significant correlation between respiratory rate and heart rate while ( $P= 0.001$ ).

**Table (1): Percent distribution of the studied children according to their socio-demographic characteristics**

Socio-demographic characteristics	The studied nursing students (n=60)			
	Control group (n=30)		Study group (n=30)	
	No.	%	No.	%
<b>Age (in years)</b>				
3 – 5	16	53.3	12	40.0
6 – 8	14	46.7	18	60.0
<b>Mean ± SD</b>	<b>5.336 ± 1.920</b>		<b>5.766 ± 1.832</b>	
<b>Sex</b>				
Male	20	66.7	19	63.3
Female	10	33.3	11	36.7
<b>Diagnosis</b>				
Urinary diversion	1	3.3	0	0.0
Umbilical hernia	12	40	11	36.6
Splenectomy	4	13.4	5	16.7
Cystocele	1	3.3	0	0.0
Appendectomy	4	13.4	8	26.7
Pyeloplasty & surgical correction in the renal pelvis	1	3.3	1	3.3
Abdominal pelvic defect	3	10	1	3.3
Narrow renal pelvis	1	3.3	0	0.0
Colectomy and colon dilation and surgical repair	2	6.7	1	3.3
Abdominal wall defect repair	1	3.3	0	0.0
Ureteral stent and ureter transplant	0	0.0	2	6.7
Hypospadias surgical repair	0	0.0	1	3.3
<b>Medical history</b>				
No disease	25	83.3	25	83.3
Familial Mediterranean fever	3	10.0	0	0.0
Esophageal varices and Familial Mediterranean fever	1	3.3	0	0.0
Allergic Bronchitis	1	3.3	0	0.0
Thalassemia	0	0.0	5	16.7



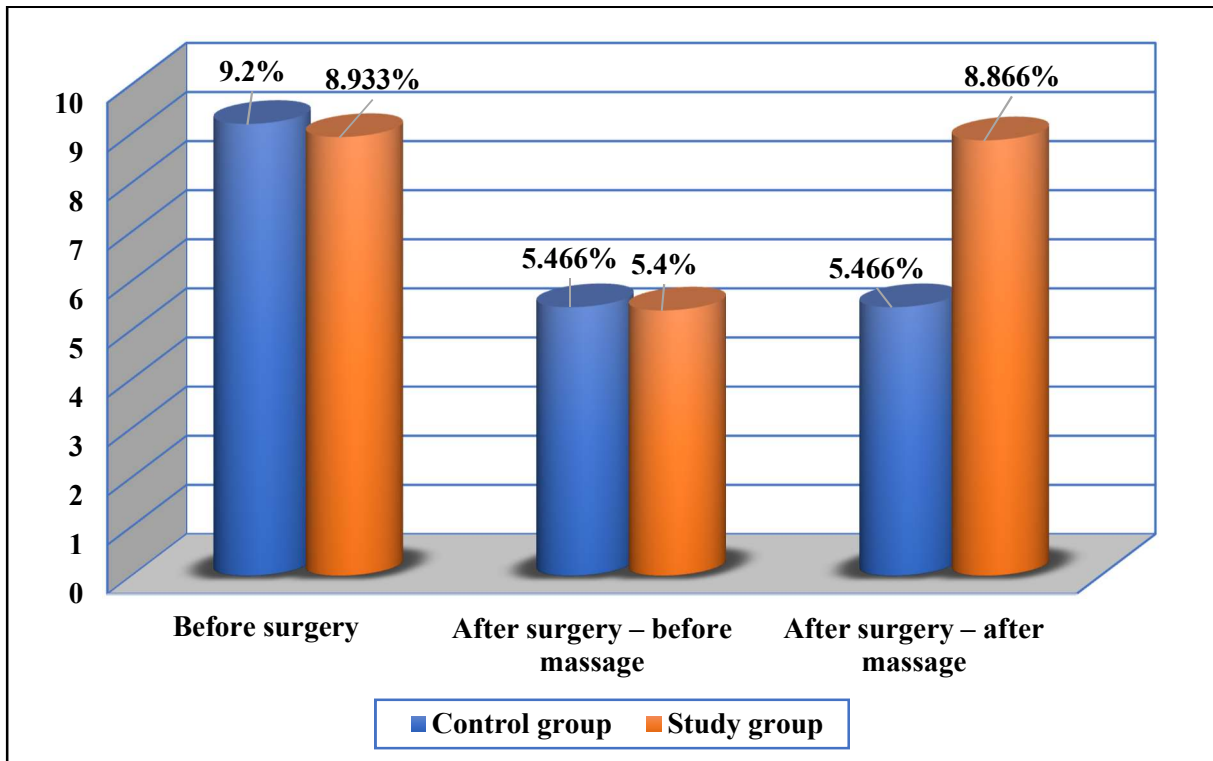


Figure (1): Mean score of studied children according to sleep/wake rhythms before, after surgery and after Massage

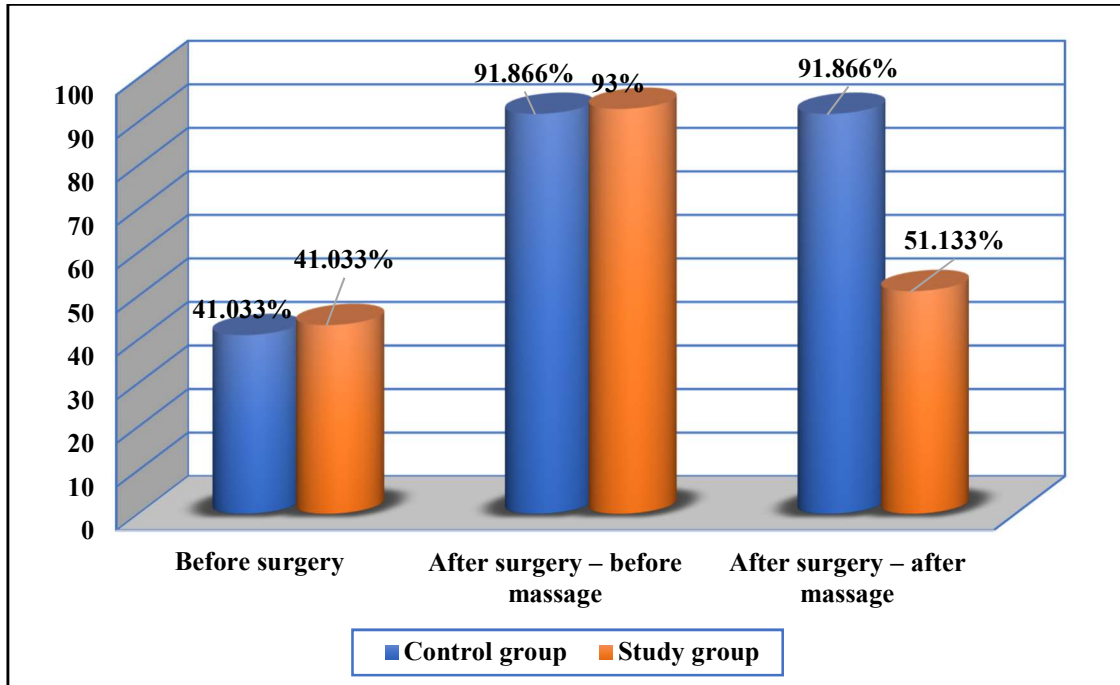


Figure (2): Mean of total score of studied children according to assessment sleep disturbances scale before and after surgery

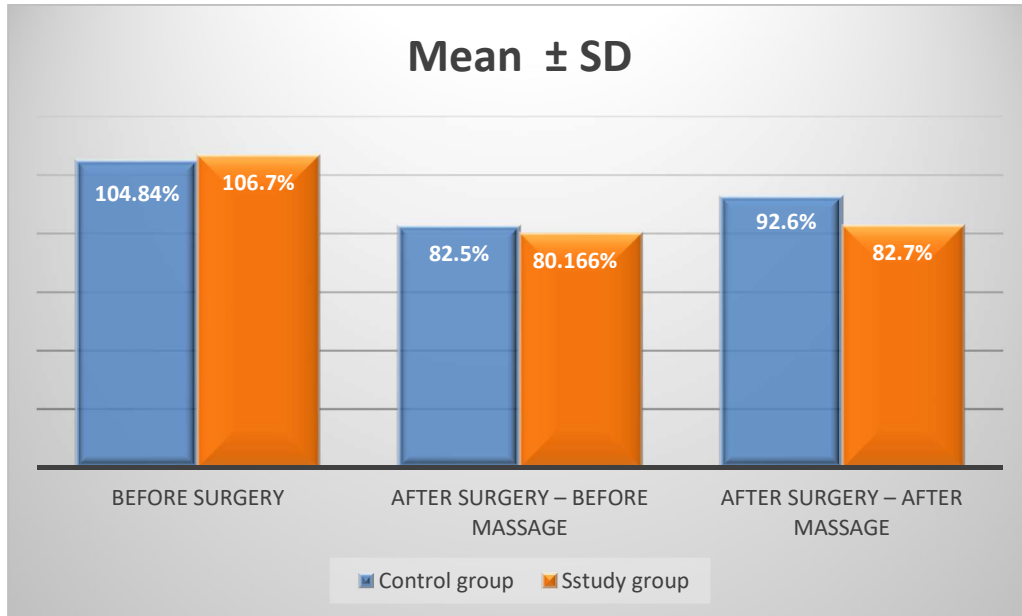


Figure (3): Mean total score of studied children according heart rate before and after surgery.

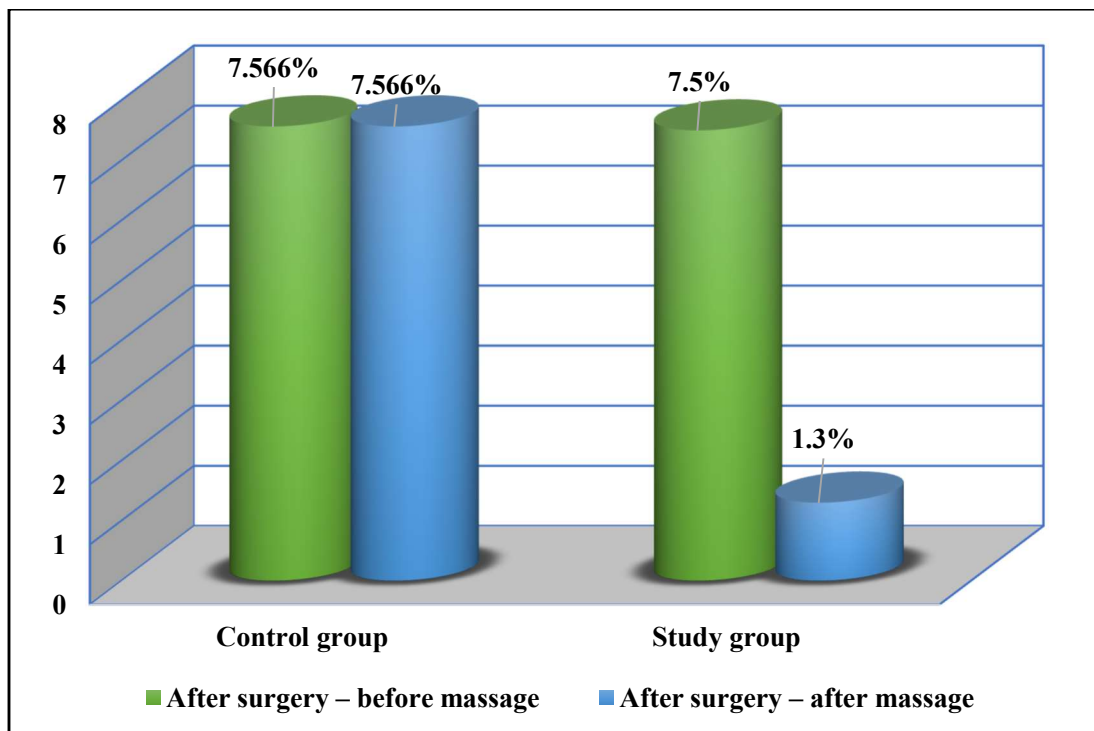


Figure (4): Mean score of pain for the studied children after surgery.

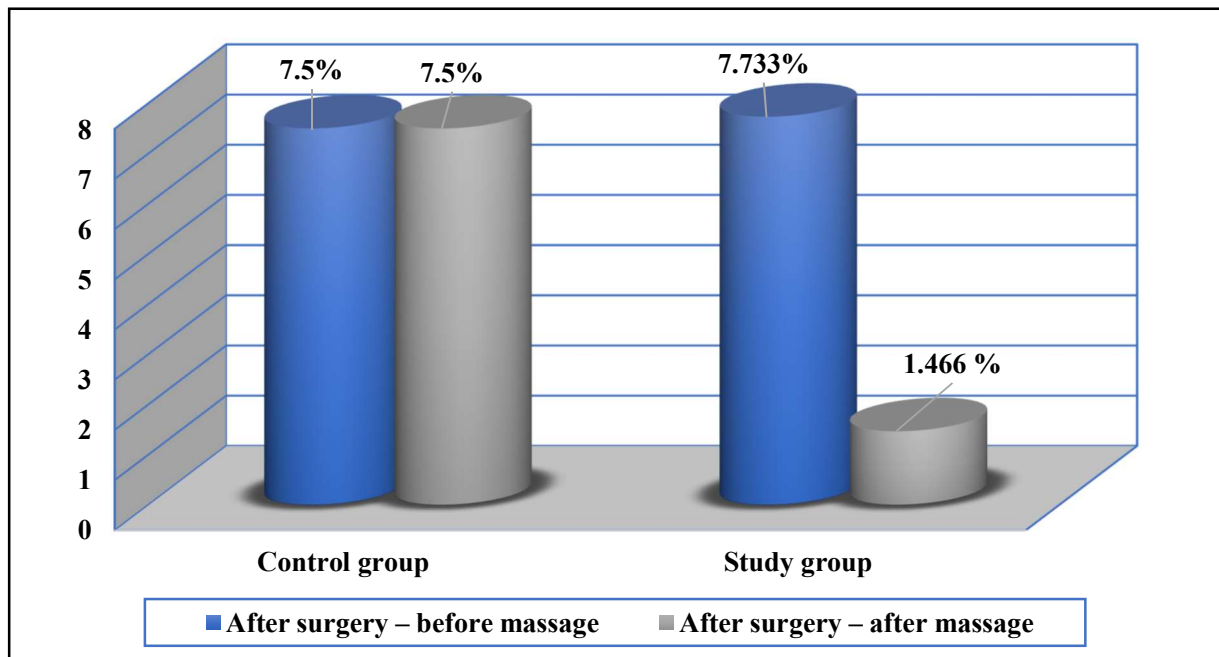


Figure (5): Mean of FLACC behavioral pain assessment scale of the studied children after surgery.

Table (2): Correlation between sleep diaries, sleep disturbances scale, and physiological measurement for control group before surgery

Correlation between sleep disturbances and physiological measurement		Control Group (n=30)		
		Heart rate	Respiratory rate	Oxygen saturation
Sleep/wake rhythms day	r	0.005	0.113	0.248
	P value	0.979	0.554	0.187
Sleep Disturbances Scale	r	0.260	<b>0.488</b>	0.130
	P value	0.165	<b>0.006**</b>	0.494

\*\* Highly Statistically Significant Difference at (P<0.001).

**Table (3): Correlation between sleep diaries, sleep disturbances, physiological measurement, and pain scales for study group post-surgery after massage therapy**

Correlation between sleep diaries, sleep disturbances, physiological measurement, and pain scales for study group post-surgery after massage		Study Group (n=30)		
		Heart rate	Respiratory rate	Oxygen saturation
Sleep/wake rhythms day	r	0.050	-0.186	-0.023
	P value	0.795	0.324	0.904
Sleep Disturbances Scale	r	-0.046	0.331	-0.135
	P value	0.808	0.074	0.476
Numerical rating scale and Face rating scale	r	0.468	0.687	0.268
	P value	0.009**	0.0001**	0.153
FLACC scale	r	0.371	-0.248	0.126
	P value	0.044*	0.186	0.507

\* Statistically Significant Difference at (P<0.05).

\*\* Highly Statistically Significant Difference at (P<0.001).

## Discussion

After abdominal surgery children were sleep deprived, sleep disturbances are common problems among children in the hospital. Poor sleep pattern can lead to adverse effects on health and recovery. Pain after abdominal surgery has a significant effect on physiological and psychological aspects of children. Nurses have a critical role in the management of postoperative pain. As a result, non-pharmacological techniques like massage that help to alleviate postoperative pain. Massage, as one of the complementary therapies, was found to reduce pain in children with acute postoperative pain and improve sleep pattern. <sup>(23)</sup> Regarding socio-demographic characteristics among the studied groups. It was observed that more than half of them were in the school stage. As they could

understand the nature of sleep disturbances, and the rationale and strategy of massage therapy. Children were often involved in decisions about acceptance of procedure and where they would and not like to be touched, also the possibility of stopping the massage at any time. The present result was similar to that found **Al-Rafay et al (2019)** who mentioned the effect of massage on sleep disturbances of children after abdominal surgeries and the study findings indicated that age of participant children in both groups were in the school age. Also, this result was in matching with **Ahmed et al (2020)** who showed that more than half of the study group and control group were in the school stage. <sup>(24)</sup>

Regarding to sleep wake rhythms There was no statistically significant difference between control and study group before

surgery and after surgery before doing massage therapy, while there was highly statistically significant difference between control and study group post-surgery and after doing massage therapy. The present result was in an agreement with **Ackerman et al (2018 )** who observed significant improvements of relaxation and night sleep hours along 3 nights of study among children Furthermore, **Ackeman (2018) et al.** who supported positive effectiveness of massage therapy in improving the quality of sleep, indicating that it had a positive influence on sleep promotion. Similar, **Miozzo et al. (2019)**, who mentioned that children at who implementing massage therapy at least once a day for 20 min in the early days after surgery confirmed a remarkable reduction in the pain and improving the quality of sleep <sup>(25,26)</sup>.

Regarding the total score of the studied children according to assessment of sleep disturbances scale for children. It was observed that most of control group had been clinically significant sleep disturbances, while study group were normal sleep after surgery after doing massage therapy, there was a highly statistically significant. This may be explained that the good impact of the foot massage on improving the quality of sleep. The present result was in an agreement with **Al-Rafay et al (2019) who** mentioned that the scores of sleep disturbance indicated fewer sleeping disturbances among children in the study group along three nights after massage intervention. Massage intervention expressed best results in the third night when of participant children of the study group had “normal sleeping” and improving in the total scores of sleeping disturbances compared to children of the control group. Moreover, massage intervention helped

children of the study group to overcome their sleep disturbances. They got more hours of night sleep and needed fewer minutes to fall asleep <sup>(24)</sup>.

Regarding the percent distribution of physiological measurement heart rate, respiratory rate and oxygen saturation for the children there was a highly statistically significant difference between control and study groups after surgery after doing massage. This justification with **Al-Rafay et al (2019)** who mentioned that concerning physiological measures, shows improving of the heart rate, respiratory rates and higher percent of oxygen saturation as a response to massage intervention among children of the study group compared to in the control group <sup>(24)</sup>

The current study revealed that, most of study group had mild and no pain respectively after surgery after doing massage therapy, with highly statistically significant difference. This justification goes with **El-ghiety et al (2021)** who revealed that during the posttest all post abdominal surgery **children** had a mild level of pain in experimental after foot massage application. Also, this result is similar to the study of **Van (2017)** who studied "foot and hand massage as an intervention for postoperative pain" and found on the first postoperative day, 20 minutes of foot and hand massage significantly reduced both pain intensity and pain distress in postoperative patients <sup>(27,28)</sup>.

Regarding FLACC behavioral the result of the present study was in the same line with, **Kaur et al. (2019)**, who studied "The effects of hand-foot massage on postoperative pain in pediatric patients who had abdominal surgery and mentioned that foot and hand massage was effective in

decreasing postoperative pain in abdominal surgery for pediatric patients. These results are in the same line with **Bauer et al.(2020)**, who investigated "the effect of foot massage versus relaxation on the postoperative back pain who reported that pediatric patient receiving massage therapy had a significant decrease in pain <sup>(29,30)</sup>.

Regarding correlation between sleep diaries, sleep disturbances scale, and physiological measurement for control group before surgery. It was found that there was a positive statistically significant difference sleep/wake rhythms day, heart rate, and respiratory rate. These findings were in agreement with **Ahmed et al (2020)** who presented the correlation between mean pretest score of sleep pattern and statistically significant differences were found between pretest score of sleep pattern of child and physiological measurement <sup>(31)</sup>. Regarding correlation sleep diaries, sleep disturbances scale, physiological measurement, and pain scales for study group after surgery after massage therapy It was observed that there was a positive highly statistically significant difference between age, Sleep Disturbances Scale, respiratory rate and Numerical and Face rating scale. These finding was gone on line with **Ahmed et al (2020)** who found that regarding correlation between mean first posttest score of sleep pattern It was found that statistically significant differences was found between posttest score of sleep pattern and children physiological measurement. <sup>(31)</sup>

### Conclusion

-Children in the study group significantly improved of sleep disturbances after implementing massage therapy postoperatively decreased pain level.

-The difference was statistically significant after implementing massage therapy in the study group than control group.

-Significant improvement in sleep pattern and pain relieve among study group than control group after implementing massage therapy postoperatively.

### Recommendations

1-In-service educational programs must be designed and implemented for nurses at pediatric surgical department about importance of massage therapy

2-Developing a system for evaluating nurses' knowledge and practice regarding updated strategies in care of children undergoing abdominal surgeries at pediatric surgical department units.

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