Aromatherapy as a Non-Pharmacological Intervention to Improve Sleep Patterns Among Children After Abdominal Surgeries

Background: One of the difficulties faced by children undergoing abdominal surgery is sleep disturbance. Aromatherapy is an alternative and supplementary treatment that enhances sleep quality and encourages relaxation.

Aim: The aim of this study is to evaluate the effect of aromatherapy as a non-pharmacological intervention to improve sleep patternsamong children after abdominal surgeries.

Method: A quasi-experimental study was utilized.

Setting: The study was conducted in the pediatric surgical department of Mansoura University Children's Hospital.

Subjects: A purposive sample of 50 children who underwent abdominal surgery was included.

Tools: Data were gathered using two tools. The first tool was a structured interview questionnaire sheet designed about characteristics and clinical data of studied children and their caretakers. The second tool was the sleep assessment scale.

Results: There were highly statistically significant differences between pre- and post-intervention (P=0.001)after application of aromatherapy among studied children. **Conclusions:** Aromatherapy can significantly improve sleep quality among children post abdominal surgeries. **Recommendation**:Aromatherapy should be used asa routine nursing intervention to improvesleep quality for children after abdominal surgeries.

Keywords: Abdominal Surgeries, Aromatherapy,Children, Sleep

1. Introduction

One of the most common invasive operations involving body incision is abdominal surgery, which is typically accompanied by discomfort, bleeding, and an increased risk of morbidity and death in children. Additionally, they view it as a distressing, stressful, and painful experience (El Mwafie&Abduallah, 2020; Ghollami, Mojen, Rassouli, Farahani &Dadashi, 2024). According to Mahna, Ouda, and Sadek (2021), intestinal obstruction, hernias, and appendicitis are the most prevalent abdominal issues in children that need surgical treatment.

Children's health and well-being depend on sleep, a biological process. According to Liu, Rovit, Pitt, and Lipman (2024), sleep is essential for brain function as well as systemic physiology, which includes metabolism, appetite control, the immune system, hormones, and cardiovascular systems. Sufficient duration, excellent quality, suitable timing and regularity, and the absence of sleep disorders and disruptions are characteristics of normal healthy sleep (Medic, Wille &Hemels, 2021).

Children in hospitals often suffer from sleep disorders for a variety of reasons, including their physical condition, medication, fear of dying, light, noise, unpleasant smells, foreign objects, nursing interventions, invasive procedures, disease complications, loss of privacy, and being away from family (Burger et al., 2024). Children cannot take advantage of the therapeutic benefits of sleep since they are up for extended periods of time. A person's immune system, wound healing process, and cognitive abilities are all negatively impacted by inadequate and unsatisfactory sleep, which also raises stress and anxiety levels (Sampath et al., 2022).

According to studies conducted internationally, the prevalence of sleep disorders in school-age children ranges from 1 to 43% (Baddam et al., 2024). Aromatherapy is a non-pharmacological treatment for sleep disorders that involves applying plant essential oils directly to the skin, which is a more successful technique (Szymczak et al., 2025). Depression, anxiety, relaxation, and issues with stress and sleep are all treated with aromatherapy (Kudchadkar et al., 2022). Lavender essential oil, which is frequently used in aromatherapy, is said to have antibacterial, antifungal, antidepressant, and stress-relieving properties in addition to its effects on the amygdala, sedative effects, and carminative (smooth muscle relaxing) qualities, all of which have an impact on the quality of sleep.It is also claimed to be the least toxic and allergenic among essential oils (Salarfard et al., 2023).

The benefits of lavender's aroma showed that linalool and linalyl acetate present in this plant can stimulate parasympathetic system. Linalyl acetate has narcotic effects and acts as a sedative. This herb improves the heart function and as a circulatory stimulant, it has beneficial effects on coronary blood flow. Also, lavender essential oil had a positive effect on the quality of sleep and anxiety(Akgül et al., 2021).

Both pharmaceutical and non-pharmacological approaches are used to treat sleep problems. Pharmacological treatments that involve sedative-hypnotic agents can greatly improve the quality of sleep; nevertheless, these medications are said to have adverse effects, lead to addiction, and not give enough sleep. Because non-pharmacological approaches are safer and

have less adverse effects than pharmaceutical methods, it is crucial to use and execute them. Following the intervention, there was a notable difference in the quality of sleep patterns (Hamza, Bahgat&Elkhedr, 2023).

In addition to, knowing how to detect physiologic changes related to sleep patterns and how to treat them, nurses must be able to appropriately assess the severity of sleep patterns and be ready to handle the psychosocial experiences that go along with them. When assessing and managing sleep patterns, nurses should be aware of pertinent research and evidence-based guidelines (Qi, Yang, Huang, Han, & Li, 2025).

Aim of the Study

The study'saim was evaluate the effect of aromatherapy as a non-pharmacological intervention to improve sleep patterns among children after abdominal surgeries.

Research Hypothesis

H0: Aromatherapy has no effect on sleep patterns among children after abdominal surgeries.

H1: The application of aromatherapy is expected to improve sleep patterns among children in the study group post abdominal surgeries.

2. Method

2.1.Design

A quasi-experimental research design was utilized to conduct this study (one group pretest - posttest design).

2.2.Setting

This study was carried out in the Pediatric Surgical Department of Mansoura University Children's Hospital (MUCH), which serves pediatric patients from Mansoura and neighboring regions within the Dakahlia Governorate.

2.3.Study Participants

A purposive sample of 50 post-operative abdominal surgeries children who were admitted to the aforementioned setting during the collection phase were enrolled in this study based on the following minimum inclusion criteria: children of both sexes between the ages of 6 and 12 who were conscious, had a caregiver, had no history of respiratory conditions or smell issues, and were undergoing abdominal surgeries for conditions like acute appendicitis, intestinal obstruction, inguinal, or umbilical hernia.

Data Collection Tools

Tool I: A structured questionnaire sheet (pre-test)

It was developed by the researcher after an extensive review of relevant literature (Czarnecki, Michlig, Norton, Stelter& Hainsworth, 2022;Hamza, Bahgat&Elkhedr, 2023)to gather the required information organized into the following two parts:

Part 1: Characteristics of the studied children and their caretakers:Including age, weight, level of education and birth order. Theircaretakerscharactaristics: including age, educational level, and occupation

Part 2: Clinical data of studied children: Including child's diagnosis,type of abdominal surgery, and postoperative analgesic taken.

Tool II: Pittsburgh Sleep Quality Index Scale (pre- post intervention)

Pittsburgh Sleep Quality Index. It is a self-report questionnaire that assessed sleep quality and sleep pattern. It was adapted from Buysse, Reynolds, Monk, Berman, & Kupfer (1989). The scale consisted of 5 components such as subjective sleep quality, sleep latency, habitual sleep efficiency, sleep disturbance, and day time dysfunction. This rating scale consists of 30 items based on the 5 components. The scale was used for the pre and post-test. Scoring of answer is based on 4-point rating scale (0 -3).

Scoring system

Quality of sleep	Score
Good quality of sleep	0-30
Fair quality of sleep	31-60
Poor quality of sleep	61-90

2.3.1. Validity and Reliability

The fulfilled clarity and validity of tool I (parts I and II)were assessed by a panel of five academic staff inpediatric nursing field, Faculty of Nursing, Mansoura University. The coefficient of reliability was done to evaluate the internal consistency of the Pittsburgh Sleep Quality Index Scale (Tool II) was r = 0.86, using the Cronbach's alpha value.

2.4.Pilot Study

A pilot study was applied on 10% of the subjects (5 children having abdominal surgery) to ascertain the tools' usability and clarity.

Fieldwork:

Data collection period

Data was gathered during a six-month period, from 1st of September 2024 to the end of February 2025. The researcher was available 3 days per week from 8:30 am till 7pm for data gathering and implementation of aromatherapy technique using the previously mentioned s tools.

The study's framework was implemented in four stages.

1) Assessment stage.
2) Planning stage.
3) Implementation stage.
4) Evaluation stage.

1) Assessment stage

Before beginning aromatherapy, the researcher conducted an assessment phase in which the youngsters who will participate were chosen according to predetermined qualifying criteria. In order to develop rapport and facilitate efficient communication, the researcher first greeted and introduced herself to the children and their accompanying moms or caretakers. After answering any queries and confirming their desire to participate, the researcher went over the goals and methods of the study. After that, baseline data were gathered.

2) Planning stage

In order to meet children's needs and manage their sleep disturbance, goals, priorities, and expected outcomes were defined based on the results of the assessment phase.

3) Implementation stage

This phase included the implementation of aromatherapy as the following:

Study Intervention

The studied children received routine hospital care in addition to aromatherapy for pain management. Two drops of 100% pure organic lavender oil were spelled on a cotton ball, then the researcher held the cotton and fixed it at 5 cm distance from the child’s nose and

asked the child to breathe slowly for 10-15 minutes (Khattab et al., 2022).Four sessions were done as the following: two sessions performed on the 1st day of operation and two sessions were performed on the 2nd day of operation. One session was performed in the morning shift and the 2nd session was performed in the night shift.

4) Evaluation phase

After the aromatherapy intervention was implemented, the children's sleep patterns were assessed using tool II . The experimental groups' sleep patterns were evaluated on the morning of the second and third postoperative days of aromatherapy treatment (two post-tests were undertaken to measure sleep patterns). The impact of the intervention on attaining outcomes, such as enhancing children's sleep quality following abdominal surgeries, was assessed by comparing children's pre- and post-test results.

Statistical Analysis

SPSS 24 was used to analyze the data. Frequency, percentage, mean, and standard deviation are examples of descriptive statistics that were used. ANOVA and the Kolmogorov-Smirnov test were employed to determine whether the data were normal. The Friedman test and the independent t-test were employed. To find differences, the Wilcoxon test was employed. Two sets of continuous data were correlated linearly using the Pearson correlation coefficient. The significance of the P-value was determined as follows: P-value > 0.05 was considered insignificant, P-value < 0.05 was considered significant and P-value < 0.001 was considered highly significant.

2.5.Ethical Considerations

The Mansoura University Faculty of Nursing's Research Ethics Committee granted ethical approval for the study, with reference number 339. Additionally, the trial was registered with the code NCT07157501 on ClinicalTrials.gov. Each child's caregiver gave their oral agreement after being fully informed of the study's objectives. The freedom to leave the study at any time without facing any repercussions was explained to the participants. Throughout the investigation, rigorous measures were taken to ensure the confidentiality and anonymity of all data obtained.

3. Results

Table (1)showed the demographic characteristics of the studied children revealed that more than three-quarters (76%) were aged between 9 and 12 years, with a mean age of

9.68 ± 1.81 years. Concerning birth order it was found that, more than one-third (36%) of the children were second-born. Regarding educational level, one-third (30%) of the studied children were enrolled in the sixth grade of primary education.

Table (2) showed clinical data of studied children. Regarding to children's diagnosis it was found that appendicitis was the most prevalent diagnosis among studied children, with 42% of them diagnosed with this condition. In contrast, only 4% of studied children were diagnosed with hernia. Furthermore, it was observed that 76% of studied children underwent open surgical procedures. Regarding the type of analgesic administered post-abdominal surgery, it was found that the majority (90%) of studied children received Perfelgan for relieving postoperative pain.

Table (3) showed the demographic data of the studied children's caretakers. It was observed that, more than one third (40%) of mothers in the aromatherapy were aged between 20 and 30 years. The mean age of mothers was 35.56 ± 5.07 years. Regarding to mothers' educational level, it was found that, 48% of mothers had attained university level education. Furthermore, more than two thirds (68%) of mothers were non-working.

Table (4)showed comparison of mean score of the sleep quality among studied children, it was fond that, the majority (90%) of studied children reported poor sleep quality before applying the intervention compared with 72% of them reported good quality of sleep after posttest 1 and the majority (80%) of them after posttest 2. Also, statically significant differences were found regarding sleep quality between pre and post intervention (p=0.001).

Table 1. *Percentage distribution of demographic characteristics of the studied children.*

Items	Aromatherapy group n=(50) no.	%
Age (years)		
6-<9	12	24
9-≤12	38	76
Mean(SD)	**9.68(1.81)**	
Childs' weight		
<25 Kg	12	24
25-<30 Kg	12	24
≥30Kg	26	52
Mean(SD)	**28.68(5.36)**	
Childs' ranking in the family		

1st	13	26	198
2nd	18	36	199
3rd	11	22	
More than 3rd	8	16	
Residence			
Educational stage			
Frist grade	5	10	201
Second grade	4	8	
Third grade	4	8	202
Fourth grade	9	18	203
Fifth grade	12	24	
Sixth grade	16	32	204
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e 2. *Percentage distribution of clinical data of studied children (n.50).*

Items	Aromatherapy group N= (50)	
	no.	%
Childs' diagnosis		
Intestinal obstruction	16	32
Urological obstruction	6	12
Appendicitis	21	42
Abdominal exploration	5	10
Hernia	2	4
Type of surgery		
Laparotomy (open surgery)	38	76
Laparoscopic	12	24
Type of analgesic post abdominal surgery as prescribed		
Perfelgan	45	90
Ketolac	5	10

Table (3): *Percentage distribution of demographic characteristics of studied children's caretaker (n=50).*

Items	Aromatherapy group N=(50)	
	No.	%
Age (years)		
20-<30	20	40
30-<40	27	54
≤40	3	6

Mean(SD)	**35.56(5.07)**	
Educational level		
Read and write	2	4
Basic education	12	24
Secondary	12	24
University	24	48
Occupation		
Workers	16	32
Not workers	34	68

Table 4. *Comparison of the mean score of the sleep quality in study group, (n=50).*

Items	**Aromatherapy group N=(50)**						
	Baseline		**Post-test (1)**		**Post-test (2)**		**P-Value**
	No.	%	No.	%	No.	%	
Poor quality of sleep (61-90)	47	94	3	6	0	0	
Fair quality of sleep (31-60)	3	6	12	24	10	20	χ^2 **=133.9** P ≤0.001*
Good quality of sleep (0-30)	0	0.0	35	70	40	80	
$\bar{X}$ (SD)	**65.56(11.54)**		**28.86(9.69)**		**16.42(7.35)**		**F=428** **P ≤0.001*** **η^2=1.00**

4. Discussion

Sleep is linked to both physical and mental well-being and is a crucial aspect of health. Nursing professionals are still ignorant of the efficacy of sleep-promoting therapies, despite the fact that sleep disorders are among the most common issues among children following surgery and pediatric patients in hospitals. A bad sleep schedule might also have a negative impact on recuperation and health (Ahmed, Ibrahim, Mobarak& Hassan, 2019).Lavender oil has analgesic qualities, and aromatherapy is one of the non-pharmacological ways to improve sleep patterns. One technique for enhancing sleep patterns following surgery is aromatherapy inhalation using lavender oil. Additionally, managing physiological and psychological symptoms as well as controlling the sleeping

environment of pediatric patients while they are in the hospital improves their quality of sleep and speeds up their recovery after surgery. Thus, the purpose of this study is to assess how aromatherapy affects the degree of pain following abdominal surgery in children (Bertó, Rodrigo, Pérez, López, &Lozoya, 2024).

According to the current study's demographic characteristics, more than three-quarters of the children were between the ages of nine and twelve. These findings were consistent with a study conducted in 2022 by Basuony et al. on the "Effect of implementing acupressure technique on gastrointestinal problems and pain control for children post abdominal surgeries," which found that three-quarters of the sample was between the ages of nine and twelve.

According to the results of the current study, one-third of the studied children under investigation were in the sixth grade at the primary level. These results corroborated those of Sabaq, Abdelsadik, and Bayoumi (2020), who noted that over one-third of the study's participants were in the sixth grade of elementary school.

The current study's results showed that appendectomy was the most prevalent surgical procedure among the children under investigation. These results were in line with a study by Mahna et al. (2020), which also found that appendectomy was the most common surgical procedure among the children under investigation. According to the researcher, self-medication, delaying reporting to the hospital, and delaying asking parents for medical guidance about the condition are the main causes of the majority of children's ruptured appendicitis.In addition, these results disagree with Mohamed, Kereem&Elmoazen(2022), who conduct study about “Effect of protocol of care for mothers on selected postoperative outcomes among their children undergoing abdominal surgeries” and found that appendicitis was diagnosed second after hernias in most of the studied children.

In terms of the demographics of the women who looked after the children, the current study revealed that over half of them were in the 30- to 40-year-old age range. These results contradict those of Fadl et al.'s (2024) study, "Effect of Discharge Instructions for Mothers on Post-Operative Recovery of their Children with Abdominal Surgeries," which found that over half of the mothers in both the study and control groups were between the ages of 21 and 30.

According to the current study, almost half of the caregivers had a bachelor's degree. These results are consistent with research by Aleid et al. (2024) on "The Impact of Caregiver Education on the Outcomes of Pediatric Surgery Patients in Saudi Arabia," which revealed that half of the moms in the study had a bachelor's degree. These results also contradicted those of Mohamed et al. (2022), who discovered that over half of the moms in the study and control groups could only read and write.

In terms of caregivers' occupations, the current study revealed that over two thirds and over three quarters of them were stay-at-home parents. These results are consistent with a study by Mohamed et al. (2022) on the "Effect of protocol of care for mothers on selected postoperative outcomes among their children undergoing abdominal surgeries," which found that half of the mothers in the control group and about two-thirds of the mothers in the research group were housewives.Also, these findings were disagree with Esmail et al. (2020), who conduct study entitled “The Impact of Educational Guidelines on Mothers' Performance in Relation to Postoperative Gastrointestinal Mobility for Children having Abdominal Surgery” and reported that less than two-thirds of the mothers were employed and less than two-fifths were unemployed. From the researcher point of view that discrepancies in sample selection may be the cause.

The results of the current study showed that there were statistically significant differences in sleep quality between the children under study in the pretest, first posttest, and second posttest. These results were consistent with those of Elsayed, Ahmed, Anwr, and Farrag (2023), who revealed statistically significant changes in the pretest, first posttest, and second posttest between the experimental and control groups following abdominal surgery.These results are also consistent with those of Ahmed, Ibrahim, Mobarak, and Hassan (2019), who studied the "Effect of Aromatherapy Massage on Postoperative Sleep Pattern Among School-Age Children" and discovered that the mean quality of sleep score (Global PSQI score) in the posttest was significantly lower than the pretest score. This suggested that aromatherapy was highly successful in enhancing the children's sleep patterns.

Furthermore, in their systematic review and meta-analysis study titled "Use of aromatherapy for pediatric surgical patients," Czarnecki, Michlig, Norton, Stelter, and Hainsworth (2022) found that lavender oil aromatherapy considerably improved

children's sleep patterns following surgical procedures. According to the researcher, aromatherapy, especially with lavender oil, has calming and anxiolytic effects through olfactory stimulation that affects the limbic system, resulting in increased parasympathetic activity and decreased cortisol release. Deeper and longer sleep is made possible by this relaxation response, which enables the body to concentrate on tissue healing and repair.

4.1. Limitations

The study's small sample size, which came from a single hospital in a single area of Egypt, may limit how broadly the results may be applied.

Conclusion

From the current study results it was concluded that: Applying aromatherapy with lavender oil for children in the postoperative period was effective in improving sleep patterns. A statistical significant differences was found regarding sleep pattern score in first posttest, and second posttest among the studied children

5. Recommendations

The following suggestions are made: educational programs should be offered to help parents and nurses become more knowledgeable about using non-pharmacological interventions to improve children's sleep patterns after abdominal surgeries. Creating a system to assess nurses' proficiency in the most recent techniques for caring for children having abdominal procedures in pediatric surgical department units.

6. Acknowledgment

The authors are very appreciative of the cooperation of all staff in the studied pediatric surgical department and all children, and their caretakers participated in this study.

7. Declaration of competing interests

There are no potential conflicts of interest.

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