

## Effect of Foot Massage on Pain and Anxiety Levels among Patients underwent Laparoscopic Cholecystectomy

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### Abstract

**Background:** Insufficient pain treatment in the early stages after laparoscopic cholecystectomy may cause patients to breathe shallowly and quickly because they are afraid of experiencing pain. Pharmacologic and nonpharmacologic complementary therapies such as foot massage can be used to manage pain and anxiety after laparoscopic cholecystectomy. **Aim:** To determine effect of foot massage on pain and anxiety levels among patients who underwent laparoscopic cholecystectomy. **Subjects and Methods:** **Design:** A quasi-experimental design was used to achieve the aim of this study. **Setting:** The study was conducted in the General Surgery Department at Beni-Suef University Hospital. **Subject:** A purposive sampling technique was used to select a sample of 100 patients who underwent laparoscopic cholecystectomy and were assigned into two groups, with 50 patients in each group (the study and control groups). **Tools:** **Three tools were used:** (I) demographic characteristics sheet, (II) a numerical pain rating scale, and (III) a State-Trait Anxiety Inventory. **Results:** The current study revealed that there was a highly statistically significant difference and reductions in pain mean scores in study group compared to the control group after foot massage 60<sup>th</sup> min with ( $P = <0.05$ ). Also, the study demonstrated that there was a highly statistically significant difference in anxiety scores in study group after foot massage 60<sup>th</sup> min with ( $P = <0.001$ ). There was a significant positive correlation between pain intensity and state anxiety levels among the patients in study group. **Conclusion:** Foot massage had statistically significant positive effects on decreased postoperative pain and anxiety mean scores in study group. **Recommendations:** It is important to apply foot massage as a complementary treatment for patients who underwent laparoscopic cholecystectomy as it is influential in decreasing pain and anxiety levels among such group of patients.

**Keywords:** Anxiety, Foot massage, Pain, patients underwent laparoscopic cholecystectomy.

### Introduction:

Laparoscopic cholecystectomy is the most preferred method in the treatment of gallbladder stones, one of the most common digestive system problems worldwide. After laparoscopic cholecystectomy procedures, pain may be observed due to surgical manipulation, irritation from the carbon dioxide given to the intraperitoneal area, intraabdominal pressure increase, peritonitis caused by bile, and trauma caused by trocars (Dayılar et al., 2017).

It was reported that 13% of patients who underwent laparoscopic cholecystectomy experienced severe pain in the first week after surgery, and 17 – 41% were hospitalized due to pain. In a large-scale study with over 50,000 patients, Joshi and Kehlet evaluated pain severity levels. They demonstrated that patients experienced more severe pain in comparison to

'major' procedures after 'minor' surgical interventions such as appendectomy, tonsillectomy, and cholecystectomy (Koraş et al., 2019).

Additionally, the majority of patients undergoing surgical interventions experienced different levels of anxiety due to the form of anesthesia, difficulty in waking up after surgery, disability, post-operative pain, difficulty in working life, loss of body control, and fear of loss of sexual function. It is a known fact that a high anxiety level in the patient affects their pain levels during the postoperative period. Considering the complications of pharmacological methods such as respiratory depression, itching, nausea, vomiting and decreased gastrointestinal motility in the treatment of postoperative pain and anxiety, complementary and alternative therapy (CAT)

methods have gained importance (Tazuma et al., 2019).

Insufficient pain treatment in the early stages after laparoscopic cholecystectomy may cause patients to breathe shallowly and quickly because they are afraid of experiencing pain. As a result, pulmonary dysfunction may occur. Severe pain can delay early recovery and cause a decline in movement, which increases the risk of thromboembolic complications. In addition, pain-induced anxiety increases muscle tonus, which increases oxygen consumption and lactic acid production in muscles (Youssef & Hassan, 2019).

The lactic acid accumulation in muscles can cause problems such as pain or cramping. Inadequate pain and anxiety management in the early postoperative period extends the recovery period and increases the risk of complications. Therefore, it has been suggested to manage acute pain and anxiety concurrently. Pharmacologic and nonpharmacologic complementary therapies can be used to manage pain and anxiety after laparoscopic cholecystectomy. Considering the complications of pharmacologic interventions such as respiratory depression, nausea, vomiting, convulsions, itching, decreased gastrointestinal motility, and urinary retention, nonpharmacologic interventions without side effects are crucial (Sert et al., 2019).

The role of the central nervous system in pain management has gained importance via the gate control theory, which is the only theory to explain the physical and psychological components of pain. According to this theory, a gate mechanism exists in the spinal cord where painful stimulants are modulated. This gate is opened through the activation of neuron dendrites and painful stimulants reach the level of consciousness. The gate is closed through the activation of thick tendons, which means that pain is not felt because signals do not reach the level of consciousness (Wang & Keck, 2017).

Pain can be relieved with the stimulation of nociceptor nerve endings—by thick fibers—that are located on the skin's surface and trigger signals associated with the perception of pain. As nociceptors are densely located in the foot massage may effectively reduce pain (Mavridou et al., 2017).

The International Reflexology Institute defines reflexology as a technique that is applied manually to the reflex points in the hands, feet, and ears, which are associated with all glands, organs, and body parts and help normalize body functions. Reflexology may often be used as a supplement to relieve the negative effects of chemotherapy and contribute to the quality of life, regulate autonomic nervous system functions, strengthen the immune system and reduce stress, anxiety, agitation, tension, depression, fatigue, insomnia, as well as pain severity in acute and chronic painful conditions (Ozturk et al., 2017).

#### Significance of the study:

Foot massage is a type of massage, which is one of the most important complementary therapies used to improve pain (Singh & Chaturvedi, 2019).

Massage is a stand-alone nursing intervention that could be used to help patients who are in pain. Massage is simple to do, inexpensive, and requires no special equipment. It might be incorporated into routine care (Bauer et al., 2019). Massage therapy promotes circulation, making the body feels more relaxed and energized while also reducing muscle tension and pain, all of which contribute to better overall health and well-being.

Also, Koras et al., (2019) indicated that foot massage reduces postoperative pain and the use of analgesics, and causes an associated decline in anxiety levels. However, studies for evaluating pain and anxiety levels together after foot massage for such target patient population were limited. So, this study was conducted to determine the effect of foot massage on pain and anxiety levels among patients who underwent cholecystectomy.

#### Aim of the study:

This study aimed to determine the effect of foot massage on pain and anxiety levels among patients who underwent laparoscopic cholecystectomy through:

- Assessing pain levels among patients who underwent cholecystectomy.
- Assessing anxiety levels among patients who underwent cholecystectomy.
- Evaluating the effect of foot massage on pain and anxiety levels among patients who underwent cholecystectomy

**Research hypothesis:**

**H<sub>1</sub>.**The patients who underwent laparoscopic cholecystectomy who received foot massage would experience little pain intensity level than those who did not.

**H<sub>2</sub>.**The patients who underwent laparoscopic cholecystectomy who received foot massage would experience an improvement in anxiety levels than those who did not.

**Subjects and Methods:****Research design:**

A quasi-experimental research design was used to achieve the aim of this study.

**Setting:**

The study was conducted in the General Surgery Department at Beni-Suef University Hospital. This setting was selected because of the high prevalence of patients who underwent laparoscopic cholecystectomy in the selected settings and also, it serves the biggest region of the population from both rural and urban areas.

**Sample:**

A purposive sampling technique was used to select a sample of 100 patients who underwent laparoscopic cholecystectomy who were assigned randomly into two groups, with 50 patients in each group (the study and control groups). The randomization achieved by asking the patients to pick cards with numbers one and two were given to the participants. Patients selecting number one were placed in the study group, while those selecting two were placed in the control group. The study group received a foot massage, and the control group received routine care from the department such as medications and investigations. The patients included in this study were selected according to the following:

**Inclusion criteria were:**

- Aged from 20–60 years old.
- Their feet were Healthy
- Agreed to participate in the study

**Exclusion criteria were:**

- Refused to participate
- Having foot problems
- Having an injury in their extremities
- Patients with chronic diseases and mental health diseases

**Sample size calculation:**

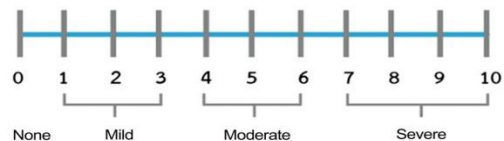
The sample size was calculated based on considering the level of significance of power analysis of 0.95 ( $\beta=1-0.95=0.5$ ) at alpha .05 (one-sided) with a large effect size (0.5) was used as the significance, 0.001 was used as the high significance.

**Tools of data collection:**

Three tools were used in this study as follows:

**Tool (I): Demographic characteristics sheet:** It included questions prepared by the researcher based on the literature concerning the demographic characteristics of the patients in the study and control groups such as their age, sex, residence, and education.

**Tool (II): Numeric Pain Rating Scale (NRS)** adopted from **John et al, (2008)**, used for assessment of the pain intensity, the child is asked to indicate the numeric value on the segmented scale that best describes their pain intensity, consists of (11 points) numeric rating scale, with 0 representing “no pain” and 10 “unbearable pain. It used twice by individual interview with researchers pre and post manipulation.



**Tool (III): State Trait Anxiety Inventory:** The State-Trait Anxiety Inventory developed by Spielberger (1972) to detect the State-Trait Anxiety level, it is a self-assessment questionnaire consisting of short statements. 20 items requiring individuals to describe how they felt themselves in a particular situation and on certain conditions, taking into account their feelings about the situation in which they were present.

In this section, expressions separated directly and reversely. The scoring was done with the SPSS program in the computer environment. Initially, two separate scales were prepared for each of the direct and reversed expressions. After being positive for direct expressions and negative for negative questions, the total weighted score for negative expressions subtracted from the total weighted score for direct expressions.

**Scoring system:**

The scale items measure the level of State-Trait Anxiety and are scored as follows: “none” (1), “some” (2), “many” (3), and “entirely” (4). The highest score obtained is 80 and the lowest score is 20.

**Validity of the tools:**

The content validity of the tools, their clarity, comprehensiveness, appropriateness, and relevance were reviewed by five experts; three professors in Medical- surgical nursing field and two professors; in the Psychiatric nursing field. Modifications were made according to the panel judgment to ensure sentence clarity and content appropriateness.

**Reliability of the tools:**

State-Trait Anxiety Inventory reliability considered good with Cronbach's alpha of 0.87 for the total score. The Pain Visual Analogue Scale (VAS) reliability was ( $r = 0.94$ ).

**Field work:****A pilot study**

To assess the clarity and feasibility of the data collection tools, a pilot study was conducted on 10% (10 patients who underwent laparoscopic cholecystectomy) of the total sample. To produce the final form of the tools, modifications were made. Patients who underwent cholecystectomy included in the pilot study were excluded from the study

**Ethical considerations:**

Before beginning the study, the researchers met with the medical-surgical directors of the selected setting to explain the study's aim and gain their cooperation. Informal consent was obtained from patients who underwent cholecystectomy to gain their cooperation. The purpose of the study was stated, as well as the expected outcomes of the study. The study's aim was explained to the patients who underwent cholecystectomy. The selected patients informed that participation in the study was entirely voluntary, and they were free to withdraw from the study at any time, without giving any reason. Also, they were told that their information would be kept private and used for research purposes only.

**Fieldwork:**

The study included 100 patients who underwent laparoscopic cholecystectomy who were assigned into two groups, with 50 patients in each group (the study and control groups). The researchers visited the previously selected settings three days / a week from 9 am to 2 pm. Data was collected within six months, from the beginning of January to the end of July 2022. Approximately, 40-50 minutes were taken to complete each interview tool.

**The actual study was divided into three phases:****A- Assessment phase:**

- The researchers met with patients who underwent cholecystectomy individually at previously selected settings and explain the aim of the study after introducing themselves to patients. The researchers complete the questionnaires (demographic characteristics, NRS, and State-Trait Anxiety Inventory).
- Patients in the control group received routine care as an analgesic treatment only; patients in the study group received foot massage in addition to analgesic treatment.

**B- Implementing Phase:**

The patients who underwent cholecystectomy were met by the researchers three times to do the following study:

- In the first time, three hours underwent cholecystectomy; the researchers complete the questionnaires (demographic characteristics, NRS, and State-Trait Anxiety Inventory).
- The researcher administered a 10-minute massage intervention on the researcher's foot (5 minutes for each).
- Initially, the researcher created a pleasant relationship with the patients who underwent cholecystectomy by engaging in brief conversations. The patients in the study group were then repositioned on the bed, and the researcher, after washing and wiping the patient's feet with a wet towel.
- At the beginning of the massage, foot warming movements were performed for about 5 minutes. Light pressure was applied to the solar plexus area of the feet for one minute

- The researchers performed a 10-minute massage intervention on the patient's extremities (5 minutes for each) whereas the massage intervention was in the study group.
- Foot massage was applied to the gallbladder and digestive and musculoskeletal areas of the right foot. Foot massage was performed only on the areas related to the digestive system and the musculoskeletal system because there is no area belonging to the gallbladder in the left foot. Light pressure was applied to the solar plexus area of the feet for one minute, and the treatment was terminated.
- Foot heating with light pressure was performed only on the dorsal areas of the patients in this group because the plantar region of the foot is associated with the gallbladder and other regions of the digestive system. The massage applied on the right and left feet was performed for a total of 10 minutes (5 minutes for each). The foot massage was performed by the researcher who has been trained and certified in this field under the supervision of a physician.
- The second time, the massage intervention in the study group was done 30 minutes after the massage, and the levels of pain and anxiety were assessed by the researchers
- The third time, the massage intervention in the study group was done 60 minutes after the massage; the levels of pain and anxiety were assessed by the researchers.

### C- Evaluation phase:

- Evaluation was done 30 minutes and 60 minutes after the massage, and the levels of pain and anxiety were reassessed by the researchers

### Administrative design:

Administrative permission was obtained through an issued letter from the Beni-Suef University Director of the previously selected department to achieve this study.

### Statistical analysis:

The data were analyzed using SPSS statistical software version 20. Continuous data were obtained before and after the massage for three days and expressed as mean standard deviation (SD). Categorical data were

expressed using numbers and percentages. The independent t-test was used to investigate differences between the two groups, while the paired t-test was employed to investigate differences between each group before and after a massage session. Changes in pain and anxiety levels were analyzed using a one-way repeated-measures analysis of variance (ANOVA). The Mann-Whitney test was used for variables that did not match the parametric assumptions. The chi-square test was used to assess the relationship between two variables in the case of noncontiguous data. A P value of less than 0.05 was used to determine statistical significance.

### Results:

**Table (1)** shows that the patients mean age in the study group were  $47.93 \pm 13.74$ , whereas in the control group it was  $46.05 \pm 12.58$  years. Regarding the level of education, it was observed that half (50%) of the patients in the study group had secondary education compared to 48% in the control group. In the study group, the same table pointed out that (54%) of them was males compared to 58% in the control group. Regarding residence, 70% of patients in the study group were living in urban areas compared to 60% in the control group.

**Table (2):** Illustrates that pain intensity mean scores of the patients in both study and control groups post the 1st massage were significantly lower than their mean scores pre the 1st massage ( $p < 0.05$ ). Additionally, pain mean scores expressed by the patients in both study and control groups post the 2nd massage were lower than those they expressed pre the 1st massage, and the mean pain scores expressed post the 2nd massage were lower than those post the 2nd massage with statistically significant differences ( $p < 0.05$ ).

**Figure 1:** Reveals that pretest (80% and 85%) of the patients had a moderate level of pain in both study and control groups respectively. while the posttest displays that the majority of the patients (98%) had a mild pain level in the study compared to 60% in the control group who had a mild pain level.

**Table (3)** shows that there was no statistically significant difference between the trait anxiety mean scores of groups ( $p > 0.001$ ). Pre and post foot massage 30th min In Post foot massage 60th min, it was found that anxiety mean scores in

both groups were lower in comparison to their anxiety mean scores post-foot massage scores 30th min ( $p < 0.05$ ), with a statistically significant difference among both groups ( $p < 0.001$ )

**Table (4):** Illustrates that there were statistically positive correlation was determined between the pain intensity and anxiety levels among the patients in the study post-massage with ( $p < 0.001$ ).

**Table (1):** Frequency and percentage distribution of the studied patients in both groups according to their demographic characteristics (N=100)

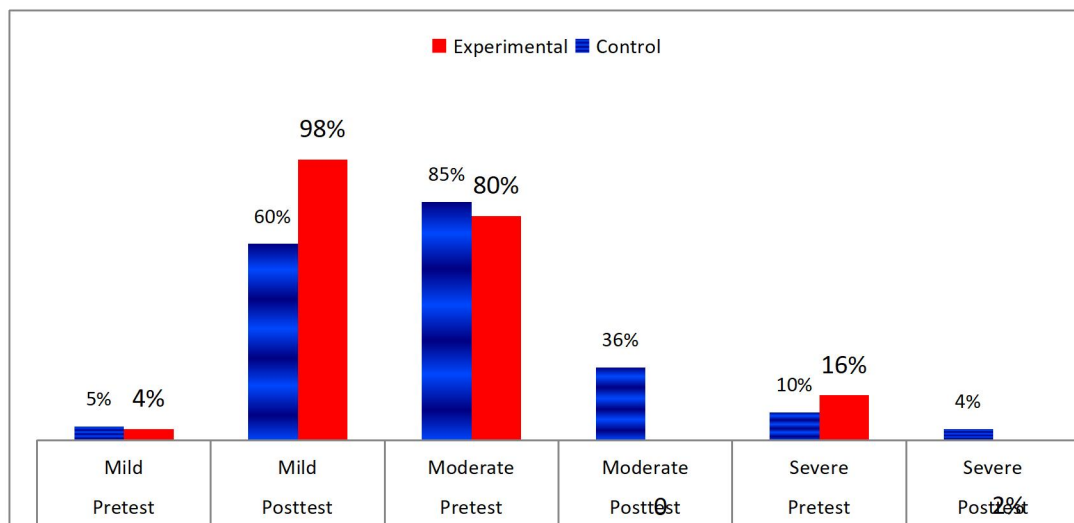
Demographic characteristics	The study group (n=50)		Control group (n=50)		X2	p-value
	No.	%	No.	%		
<b>Patients' age</b>						
- Mean $\pm$ Stander deviation	47.93 $\pm$ 13.74		46.05 $\pm$ 12.58		4	0.16 <sup>NS</sup>
<b>Patients' education</b>						
- Read and write	4	8.0	3	6.0	3	0.18 <sup>NS</sup>
-Primary education	10	20.0	13	26.0		
-Secondary education	25	50.0	24	48.0		
-University education	11	22.0	10	20.0		
<b>Sex:</b>						
-Male	27	54	29	58	3	4.33 <sup>NS</sup>
-Female	23	46	21	42		
<b>Residence:</b>						
-Urban	35	70	30	60	2	1.27 <sup>NS</sup>
-Rural	15	30	20	40		

NS-non-significant

**Table (2):** Comparison between the studied patients in both study and control groups regarding their pain intensity mean scores pre and post-foot massage (n=100)

Pain intensity	The study group (n=50)	Control group (n=50)	t-test	p-value
Pre foot massage	7.46 $\pm$ 1.87	6.70 $\pm$ 2.49 7	1.984	0.371
Post foot massage 30th min	4.60 $\pm$ 2.02	3.80 $\pm$ 2.85	5.263	0.07
Post foot massage 60th min	2.70 $\pm$ 2.15	3.16 $\pm$ 2.19	7.184	0.02*

\*= significant at  $p < 0.02$  level



**Figure 1:** Percentage distribution of the patients in study and control groups according to pretest and post-test pain intensity level (n=100)

**Table (3):** Comparison between the studied patients in both study and control groups regarding their anxiety means scores pre and post-foot massage (n=100)

State and Trait Anxiety Scale Scores	The study group (n=50)	Control group (n=50)	t-test	p-value
Pre foot massage	37.49 ± 6.42	41.42 ± 8.35	3.127	0.20
Post foot massage 30th min	36.56 ± 10.32	38.48 ± 8.97	2.009	0.36
Post foot massage 60th min	25.12 ± 2.34	31.83 ± 8.45	12.024	<0.001*

\*= significant at p<0.001 level

**Table (4):** Correlation between pain intensity levels and anxiety levels in both study and control groups post massage

Pain intensity	Anxiety levels
Study group	r 0.579
	p .000
Control group	r 0.120
	p .124

\*= significant at p<0.05 level

### Discussion:

The research hypothesis was that patients received foot massages would experience little pain and improvement in anxiety levels than those who did not. It has been reported that most patients who underwent surgical interventions had experienced different degrees of anxiety and increased anxiety levels raising morbidity and mortality rates, delaying wound healing, and extended hospital stay, as well as increasing postoperative pain levels and requirement of analgesics (Dayilar et al., 2017).

Inadequate pain and anxiety management in the early postoperative period extends the recovery period and increases the risk of complications (Mavridou et al., 2017). Hence, the study aimed to determine the effect of foot massage on pain and anxiety levels among patients who underwent cholecystectomy

The findings of the current study indicated that no significant difference was detected between the two groups in their demographic data. From the researchers' point of view, this confirmed that the baseline of pain and anxiety disturbances was similar in the two groups.

The results of the present study pointed out that the mean pain scores intensity expressed by the patients in the experimental group after the 2nd massage were lower. From the researchers' point of view, this finding reflected the positive effects of foot massage on pain intensity level among patients and confirm the study hypothesis stated in H<sub>1</sub>.

This result is supported by Shehata et al. (2016) who conducted study entitled the effect of foot massage on pain level among patients after abdominal surgery and applied foot massage in two sessions on these patients, and after the first and second applications, the expression of the pain by the patients in the study group was found to be lower than that of the patients in the control group. Also, in the study performed by Çankaya and Sarıtaş, (2018) on patients after laparoscopic cholecystectomy, it was revealed that the pain level in the study group was lower than that in the control group as a result of conventional foot massage performed for 10 minutes.

Abbaspoor et al., (2018) in their study entitled " Effect of foot and hand massage in postcesarean section pain control " who determined the pain intensity immediately and 90 minutes after foot massage. The pain intensity was reduced after the intervention compared with before the intervention. Similarly, Youssef and Hassan, (2019) found in their study entitled " The effect of hand and foot massage on alleviating pain and anxiety of abdominal post-operative patients at a university hospital " that foot massage was significantly associated with the reduction in pain and anxiety of patients who had abdominal surgery as cholecystectomy.

This result is supported by Hudson et al. (2019), who studied " The impact of hand reflexology on pain, anxiety, and satisfaction during minimally invasive surgery under local anesthetic" and it was found that the pain intensity scores of the experiment and control groups were significantly different, and the

duration of the pain in the experiment group was shorter.

In the study conducted by **Silverdale et al., (2019)** on 38 patients who underwent radical cystectomy due to bladder cancer and reported that foot massage group their pain levels after both treatments were lower than before the massage.

The results of the present study revealed that the mean pre-foot massage anxiety scores in both groups were significantly lower in comparison to their mean post-foot massage scores ( $p < 0.05$ ), but there were statistically significant differences among both groups, post-foot massage 60th min regarding their mean scores anxiety ( $p < 0.001$ ).

This study is similar to the study conducted by **Hudson et al., (2019)** about the effects of reflexology massage performed on patients undergoing minimally invasive surgery on their pain and anxiety, who found that the levels of anxiety felt by the patients during the procedure in the treatment group were significantly lower than those in the control group.

Also, the results of the current study are matched with **Koraş et al., (2019)** examined the effects of foot massage performed on patients undergoing laparoscopic cholecystectomy on their pain and anxiety levels, and found that the anxiety score of the patients in the experiment group was found to be lower than that in the control group.

Similarly, **Youssef & Hassan, (2019)** found that the anxiety level was lower in the foot massage group after the application.

In another study conducted by **Tsay et al., (2018)** about " Effects of reflexotherapy on acute postoperative pain and anxiety among patients with digestive cancer " it was found that there was decreasing in the anxiety levels of the experiment group after the intervention.

Many studies reported that the anxiety levels of the patient groups that received foot massage were significantly lower than those in the control groups that were conducted by **Pasyar et al., (2018)** entitled " The effect of foot massage on pain intensity and anxiety in patients having undergone a tibial shaft fracture surgery " and **Ozturk et al., (2017)** about The effects of

reflexology on anxiety and pain in patients after abdominal surgery".

**Sozen et al., (2020)** also, found in their study about " Efficacy of Hand and Foot Massage in Anxiety and Pain Management Following Laparoscopic Cholecystectomy " that foot massage decreased pain and anxiety levels in patients undergoing laparoscopic cholecystectomy surgery.

In addition, **Koraş et al., (2019)** observed in their study about "The Effect of Foot Massage on Postoperative Pain and Anxiety Levels in Laparoscopic Cholecystectomy Surgery" that foot and hand massage was influential in decreasing pain and anxiety levels after surgeries for patients who underwent laparoscopic cholecystectomy.

The result of the current study revealed that statistically positive correlation was determined between the pain intensity and anxiety levels among the patients in the study group. Therefore, a decline in pain intensity after foot massage is also associated with a decline in the state of anxiety level. Thus, foot massage is effective for pain management and successful pain management is associated with lower anxiety levels in the patients. Supporting these findings, **Grealish et al., (2019)** who studied " Foot massage: A nursing intervention to modify the distressing symptoms of pain and nausea in patients hospitalized with cancer " and stated that there was a positive significant relationship between the pain intensity and state anxiety.

### **Conclusion:**

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Based on the results and hypotheses of the present study, the study findings concluded that Foot massage had statistically significant positive effects on decreased pain and anxiety mean scores among patients in the study group. The study revealed that there was a difference between mean scores were found statistically significant at  $p < 0.05$  level in the study group regarding pain and anxiety levels.

### **Recommendations:**

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The following suggestions are made based on the current study's findings:

- Foot massage is useful as a complementary treatment to be applied for all patients who



underwent cholecystectomy as it is influential in decreasing pain and anxiety levels among study group of patients who underwent cholecystectomy.

- Improving patients who underwent cholecystectomy' awareness about foot massage and its positive effect in reducing pain and anxiety levels.
- Further studies about the effect of different massage techniques on pain and anxiety among patients who underwent cholecystectomy to minimize the physical and psychological problems.

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