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Original Research

The Effects of Acupressure on Postoperative Gastrointestinal Function and Pain in Women with Hysterectomy: A Randomized Controlled Study

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Abstract

Background: Hysterectomy is one of the most commonly performed abdominal surgeries. Postoperative pain, nausea, and vomiting are common complications after surgery and anesthesia. Numerous studies have revealed that acupressure can increase postoperative pain, nausea, and vomiting. This randomized controlled trial was conducted to evaluate the effect of acupressure on gastrointestinal function and pain after abdominal hysterectomy. **Methods**: After undergoing hysterectomy, 39 women were randomized into acupressure (n = 19) and control (n = 20) groups. Women in the acupressure groups received acupressure on the stomach meridian (ST36), heart meridian (HT7), large intestine meridian (LI4), intersection of the spleen, liver with kidney meridians 6 (SP6) and pericardium meridian (PC6) acupoints 30 min after admission to the clinic for a period of 15 min, and acupressure on locations 1–1.5 cm away from these points. The control groups received standard treatment. Patient information, visual analog scale scores, the Rhodes Index of Nausea, vomiting with retching, and daily follow-up data were collected. **Results**: The nausea and vomiting with retching experience scores in the acupressure-treated group were lower than those in the control group ($p < 0.001$). After acupressure, the gas output from stool formation of the participants in the acupressure groups was significantly greater than that of the participants in the control group ($p < 0.001$). The intensity of pain decreased significantly in the acupressure group compared with the control group ($p < 0.001$). **Conclusions**: The findings of these trials indicated that acupressure is an effective method for reducing pain, nausea, vomiting, and recovery of vital signs. **Clinical Trial Registration**: The trial protocol was registered on the website http://clinicaltrials.gov (registration number: NCT06340776).

Keywords: acupressure; gastrointestinal motility; hysterectomy; postoperative pain; nausea; vomiting

1. Introduction

Hysterectomy, the surgical removal of the uterus, is a common procedure performed for various gynecological conditions, including fibroids, endometriosis, and malignancies. Despite its prevalence, hysterectomy is often associated with significant postoperative challenges, including gastrointestinal dysfunction and pain. These complications can delay recovery, extend hospital stays, and adversely affect patients' quality of life [1,2].

Postoperative gastrointestinal dysfunction, characterized by symptoms such as nausea, vomiting, and delayed bowel movements, is a frequent concern following abdominal surgeries such as hysterectomy. This dysfunction can result from several factors, including anesthesia, opioid analgesics, and the surgical procedure itself. Pain, another critical postoperative issue, not only affects physical well-being but also contributes to psychological distress and delayed recovery [3]. Nausea and vomiting have been the most common side effects of anesthesia since the 1800s and are the most common complications after pain [4]. Postoperative incision pain is an acute pain that begins with the stimulation of neuro-receptors from surgical trauma and usually subsides within a few days. Today, the physiology of acute pain is better understood, and new approaches to pain management are emerging [5].

Hysterectomy surgery, intraoperative traction, realignment of pelvic organs after surgery, or other effects can affect bladder and bowel function if the autonomic energy in the pelvic floor is disrupted. Autonomic energy refers to the balance between the sympathetic and parasympathetic nervous systems. Acupressure is believed to influence this balance, thereby enhancing gastrointestinal motility and pain management. This additional explanation provides a clearer understanding of the physiological basis for the effects of acupressure. In a case-control study that supported this hypothesis, it was reported that constipation tends to be associated with increased urinary frequency in women after hysterectomy [6].

The short-term goals of nursing care in hysterectomy are to control vital signs, prevent pain, ensure adequate fluid intake, prevent constipation, ensure balanced nutrition, regulate activities, and prevent the development of infection. The long-term goals are to ensure that the individual's health status is protected and improved and that she can easily express her feelings and thoughts regarding sexuality [7].

Postoperative recovery ensures rapid recovery through care and treatment practices. In recent years, the use of pharmacological and/or non-pharmacological treatments has been recommended to reduce pain and distension [8]. Traditional methods for managing these postoperative issues typically involve pharmacological interventions, such as pain relievers and medications, to stimulate gastrointestinal motility. However, these approaches often have their own set of side effects, prompting the exploration of alternative and complementary therapies. Acupressure, a non-invasive technique rooted in traditional Chinese medicine, has emerged as a potential adjunctive treatment. By applying pressure to specific points on the body, acupressure aims to stimulate the body's self-healing mechanisms, alleviate pain, and improve various bodily functions [9].

To prevent gastrointestinal complications, nurses should monitor bowel movements and gas and stool output and make plans and practices to prevent possible complications. Although acupressure, one of the interventions that can be applied for this purpose, has not yet become widespread, it is applied in many countries as a nursing intervention [10].

In a study conducted by Ünülü (2014) [11], it was reported that acupressure applied to the P6 point reduced postoperative nausea and vomiting and that its effect on vital signs was similar to that of pharmacological methods. Hendawy and Abuelnaga (2020) [12] investigated the abdomen. In a study involving 56 women who underwent hysterectomy surgery, it was reported that acupuncture applied to the ear positively affected postoperative pain control and reduced analgesic use. A meta-analysis of postoperative nausea and vomiting after abdominal surgery revealed that acupressure may be effective in reducing the incidence of postoperative nausea and vomiting and the need for antiemetic drugs, but randomized controlled acupressure studies are needed to establish definitive evidence [13].

2. Materials and Methods

2.1 Design

The trials used a randomized, controlled, single-blind design. The study complied with the guidelines of the Consolidated Standards of Reporting Trials (CONSORT) Checklist. We initially intended to assess eligibility for the randomization of 110 women; however, due to the inclusion criteria and other constraints, only 70 women were ultimately randomized into the acupressure or control group. The details of the study process are shown in Fig. 1.

The research was carried out according to the ethical principles of clinical research involving patients who were approved by the Ethics Committee of Istanbul Medipol University (decision dated 08.05.2021 and numbered 813). The trial protocol was registered on the website http://clinicaltrials.gov (registration number: NCT06340776). Necessary permission was obtained from the Provincial Health Directorate, which is affiliated with the state hospital, to conduct the study, and a voluntary consent form was provided by women who agreed to participate in the study. This research was conducted according to the principles of the Declaration of Helsinki.

2.2 Setting Up with Participants

The present study was conducted from September 2021 to June 2023 on women who underwent abdominal hysterectomy at a training and research hospital in Istanbul. They volunteered for this study and met the following inclusion criteria: were over the age of 18 years; had abdominal hysterectomy surgery; had no wounds or ulcerations in the areas where acupressure would be applied on the arms and legs; had no intestinal obstruction, irritable bowel syndrome, inflammatory bowel disease, or abdominal herniation due to bowel cancer; had defecated at least three times a week in the last trimester; had stools of normal consistency; did not develop any serious postoperative complications; agreed to participate in the study; were excluded from the study were women who had chronicle constipation, fecal incontinence or diarrhea, who used laxatives, suppositories with enemas, who were immobilized, who did not agree to participate in the study, and who did not speak Turkish.

The withdrawal criteria for women were that they no longer met the inclusion criteria or chose not to continue. Eleven of the 70 patients who met the inclusion criteria were excluded from the study for the following reasons: their own choice (n = 20) or not continuing the intervention (n = 11). Ultimately, 39 women (20 in the control group and 19 in the acupressure group) remained for further research, as depicted in Fig. 1.

2.3 Sample Size

Following the study by Durmuş İskender (2020) [14], on postoperative pain variable scores $\pm$ standard deviations for the acupressure and control groups, a sample size of at least 30 people was required per group using the G*Power 3.1.9.2 (Ver. 3.1.9.2, Franz Faul, Kiel, Germany) program with a 95% confidence interval and 80% power. By taking into consideration the data loss during the study with the analysis process, 35 women were included in each group. We used a final sample size of 20 women in the control group and 19 women in the acupressure group.

2.4 Randomization

This study included two groups: those who used acupressure (acupressure group, AG) and those who did not receive any intervention other than routine midwifery care (control group, CG). Randomized numbers between 1 and 70 were created with the help of the "Generate Numbers" function of the Randomizer.org website (https://www.randomizer.org/). Each woman who met the criteria was assigned to the relevant groups according to the order of arrival of the numbers in the randomization scheme (Fig. 1).

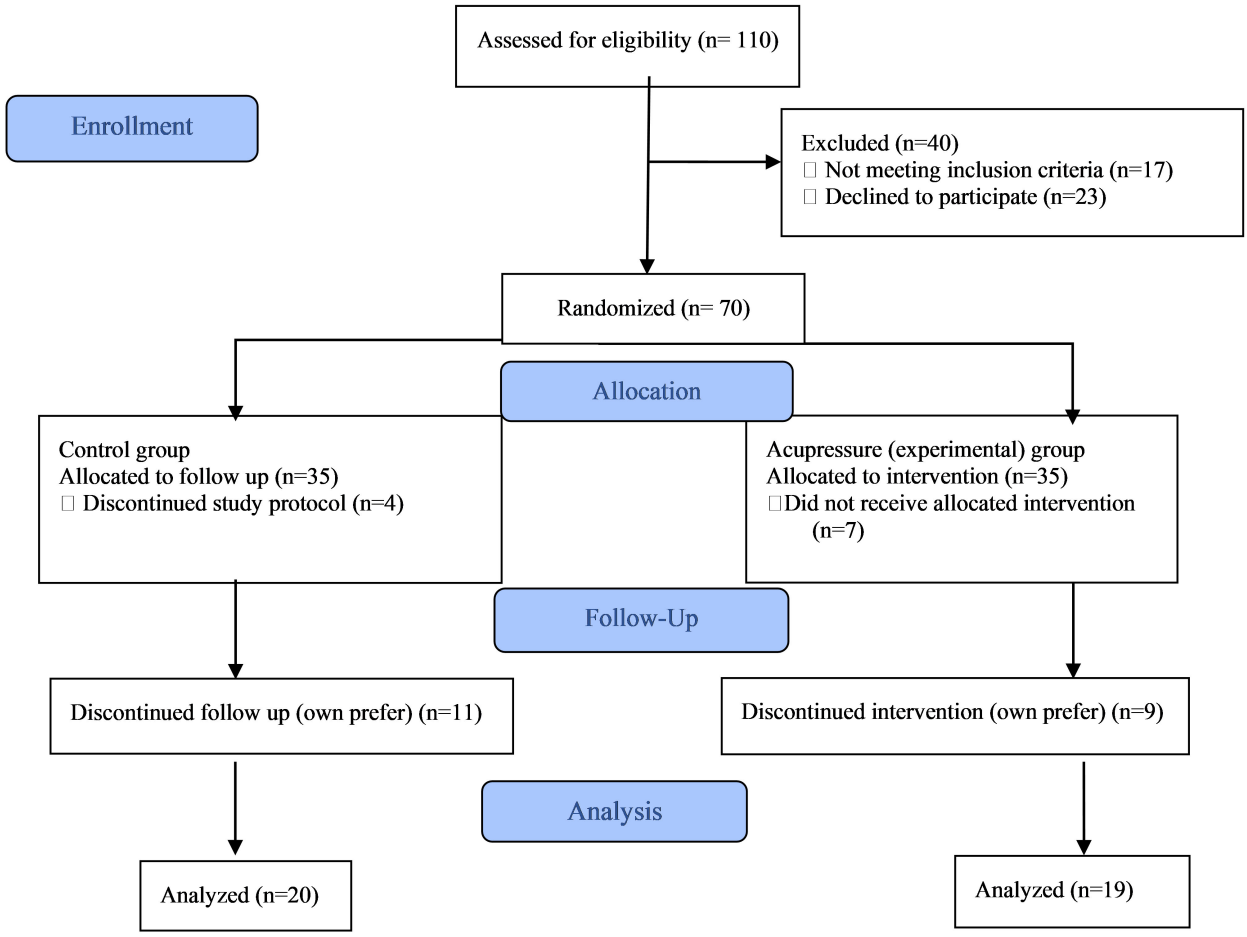

Fig. 1. The process of the study was based on the CONSORT flow diagram. CONSORT, Consolidated Standards of Reporting Trials.

2.5 Materials

Acupressure

For the acupressure intervention, planning was made to adjust the temperature, light, and environment to ensure privacy. Five points that positively affected gastrointestinal function and pain were selected (Sanyinjiao: SP6; Zusanli: ST36; Neiguan: PC6; Shenmen: HT7; and Hegu: LI4).

SP6: also known as the "Sanyinjiao" acupoint, which is located medially four fingers wide above the ankle, is commonly used for both acupuncture and acupressure and is thought to offer relief from gynecologic disorders.

ST36: also known as "Zusanli", is located on the lower leg, approximately four finger widths below the kneecap and one finger width toward the outside of the shinbone. It is believed to boost the immune system, improve digestion, and increase energy levels.

PC6: also known as "Neiguan", is involved in the anterior part of the internal organ, approximately three times the length of the arm from the left side of the arm. This point is a concentration of capacity for the alleviation of nasal congestion, pain, discomfort and stress. This is achieved by applying pressure to the pulse in circular movements that last for minutes.

HT7: also known as "Shenmen", is located on the wrist crease, on the pinky side of the palm. This point is commonly used to calm the mind, reduce anxiety, and promote restful sleep.

LI4: the "Hegu", is always at the back of the hand between the first and second metacarpals. This is achieved through the capacity of the alleviation of the blood vessel, the kidney, the digestive tract and the immune system.

2.6 Interventions

After obtaining the consent of the women who participated in the study, the inclusion groups were selected according to the order of acceptance. The purpose of the study was explained to all women, and they were informed that the data would be anonymous and that confidentiality principles would be observed.

Acupressure Group (AG): Participants in the AG received detailed information about acupressure, including the purpose, benefits, and specific points where acupressure would be applied. The preparation phase included positioning the participants comfortably to ensure relaxation and ease of access to the acupressure points.

The session duration was approximately 18–20 minutes, taking into account preparation and the actual application of pressure on the acupoints.

Acupressure was applied to the following points: SP6, ST36, PC6, HT7, and LI4. Each point was stimulated bilaterally, resulting in a total of 10 acupoints.

Pressure was applied to each acupoint for 1.5 minutes, for a total of 15 minutes of direct acupressure (1.5 minutes per point $\times$ 10 points).

The acupressure intervention was administered twice:

The first session was conducted three hours after the surgery.

The second session was conducted twenty-four hours after the surgery.

The acupressure was performed by trained professionals to ensure consistency and effectiveness.

Firm, steady pressure was applied using fingers, following traditional acupressure techniques to stimulate each point.

Participants were monitored for any adverse reactions during and after the acupressure sessions.

The effectiveness of the acupressure was evaluated based on postoperative pain, gastrointestinal function (gas output and stool formation), and the incidence of nausea, vomiting, and retching.

Control Group (CG): Participants in the control group received standard postoperative care provided by the clinic.

No additional interventions, such as acupressure, were administered to this group.

Similar to the acupressure group, participants in the control group were monitored for postoperative outcomes, including pain levels, gastrointestinal function (gas output and stool formation), and the incidence of nausea, vomiting, and retching.

Postoperative outcome data for the control group were collected and compared with those of the acupressure group to evaluate the effectiveness of the acupressure intervention.

2.7 Measurements

The following instruments were used in this study: (1) the information form, (2) the numerical pain intensity scale (NPIS), (3) the Rhodes Nausea, Vomiting and Retching Index, and (4) the daily follow-up form.

2.7.1 Introduction to the Information Form

The questionnaire, which was prepared by the researcher in line with the literature, consisted of 25 questions about the participants' sociodemographic characteristics.

2.7.2 Numerical Pain Intensity Scale

Pain intensity was evaluated using the Numerical Pain Intensity Scale (numeric), which is a single-criteria and subjective individual pain assessment method that aims to explain the severity of the patient's pain with numbers. Pain Made with Intensity Scale. The starting point of the scale, which consists of a horizontal line, is "0" or "no pain", and the ending point is "10" or "unbearable pain". There are numbers from 0 to 10 at equal intervals on the horizontal line, where 1–3 indicates mild pain, 4–6 indicates moderate pain, and 7–10 indicates severe pain.

2.7.3 Rhodes Nausea, Vomiting and Retching Index

Rhodes and McDaniel (1999) [15] evaluated twenty-four-hour nausea and vomiting, and its validity and reliability in the evaluation of postoperative nausea and vomiting have been tested. The scale was adapted to the Turkish society by Genç (2010) [16], used the Rhodes Nausea, Vomiting and Gagging Index. Rhodes and McDaniel (1999) [15] found the alpha internal consistency coefficient of the index to be 0.98. Genç (2010) [16] found the internal consistency coefficient of the index in Turkey to be 0.98. Rhodes Nausea Vomiting and Retching Index, the responses to items one, three, six, and seven are reversed. Responses for each item are scored between zero (least discomfort) and four (most discomfort) [16]. The total score is obtained by adding the scores obtained from eight items. The highest score that can be obtained from the index is 32, which is also considered the most severe symptom formation experience score. Nausea Vomiting Gagging Experience refers to the frequency of nausea, vomiting, and gagging episodes experienced by participants. Nausea Vomiting Gagging Occurrence measures the incidence of these episodes within the study period. Nausea vomiting gagging distress assesses the severity and impact of these episodes on the participants' daily lives.

2.7.4 Daily Monitoring Form

The patient's bowel sounds, flatulence time, defecation time, vital signs, and pain intensity scores were recorded for two days after the hysterectomy.

2.8 Data Analysis

The Statistical Package for the Social Sciences (IBM-SPSS 22, Armonk, NY, USA) program was used for statistical analysis. Descriptive statistical methods (mean, standard deviation, median, frequency, percentage, minimum, maximum) were used when evaluating the study data. The normality of the quantitative data was tested using the Shapiro–Wilk test and graphical analysis. Student's *t*-test was used for comparisons of normally distributed quantitative variables between two groups, and the Mann–Whitney U test was used for comparisons of non-normally distributed quantitative variables between two groups. Dependent group *t*-tests for intragroup comparisons of normally distributed quantitative variables were used. For intragroup comparisons of quantitative variables that were not normally distributed, the Wilcoxon signed-rank test was used. To compare qualitative data, the Pearson chi-square test, Fisher's exact test, and Fisher-Freeman-Halton test were used. A p value < 0.05 indicated statistical significance.

Table 1. Comparison of participants according to their descriptive characteristics.

		Group			Test Value
		Experiment (n = 19)	Control (n = 20)	Total	*p*
Age (years)	Mean ± SD	52.05 ± 8.18	51.05 ± 8.49	51.54 ± 8.24	t: 0.375
	Median (min–max)	50 (41–76)	50.5 (38–68)	50 (38–76)	[a] 0.710
Weight (kg)	Mean ± SD	73.68 ± 12.33	78.75 ± 10.79	76.28 ± 11.7	t: –1.367
	Median (min–max)	77 (55–95)	79 (53–95)	77 (53–95)	[a] 0.180
Height (cm)	Mean ± SD	166.05 ± 4.65	165.6 ± 4.37	165.82 ± 4.45	t: 0.313
	Median (min–max)	165 (160–177)	165 (158–175)	165 (158–177)	[a] 0.756
BMI	Mean ± SD	26.77 ± 4.98	28.81 ± 4.33	27.81 ± 4.71	t: –1.367
	Median (min–max)	27 (20.2–35.8)	28.5 (21.2–35.9)	27 (20.2–35.9)	[a] 0.180
Education	Primary education	6 (31.6)	6 (30)	12 (30.8)	χ^2: 1.181
	High school	8 (42.1)	9 (45)	17 (43.6)	[b] 1.000
	University	4 (21.1)	5 (25)	9 (23.1)	
	Postgraduate	1 (5.3)	0 (0)	1 (2.6)	
Working Status	Working	9 (47.4)	6 (30)	15 (38.5)	χ^2: 1.242
	Not working	10 (52.6)	14 (70)	24 (61.5)	[c] 0.265
Income status	Income equals expenses	15 (78.9)	15 (75)	30 (76.9)	χ^2: 0.086
	Income is more than expenses	4 (21.1)	5 (25)	9 (23.1)	[d] 1.000

[a] Student's *t* test; [b] Fisher Freeman Halton test; [c] Pearson chi-square test; [d] Fisher's exact test.

BMI, body mass index; SD, standard deviation.

3. Results

The ages of the participants ranged between 38 and 76 years, and the mean age was 51.54 ± 8.24 years. Table 1 presents the descriptive characteristics of the participants. There was no statistically significant difference between the acupressure and control group participants in terms of age, weight, height, or body mass index (BMI) ($p > 0.05$). In this study, it was determined that the characteristics of the women in the acupressure and control groups were similar in terms of age, weight, height, BMI, education, employment, and income level.

The distribution of the participants' mean nausea-vomiting-gagging experience scores according to group is given in Table 2. There was no statistically significant difference between the groups in terms of the nausea experience score before the intervention ($p > 0.05$). The postintervention nausea experience score of the acupressure group was significantly lower than that of the control group ($p < 0.001$).

In the acupressure group, the mean decrease of 1.37 ± 0.68 points in the scores of the participants in the nausea experience subscale after acupressure compared to before acupressure was found to be statistically significant ($p < 0.001$). In the control group, the change in the scores of the subjects in the nausea experience subscale after acupressure compared to before acupressure was not found to be statistically significant ($p > 0.05$). Among the acupressure group participants, the difference between the change in the nausea experience subdimension scores of the subjects after acupressure compared to before acupressure and the change in the scores of the control group subjects was found to be statistically significant ($p < 0.001$). The effect size obtained for post hoc power was d = 1.807, and its power was determined to be 99.97%.

There was no statistically significant difference between the vomiting experience scores of the patients before acupressure and those of the participants in the acupressure and control groups ($p > 0.05$). The difference between the change in the scores of the acupressure group on the vomiting experience subdimension before/after acupressure and the change in the control group was found to be statistically significant ($p < 0.001$). The effect size obtained for post hoc power was d = 2.696, and its power was determined to be 100%.

There was no statistically significant difference between the Gagging Experience scores of the subjects before acupressure and those of the participants in the acupressure and control groups ($p > 0.05$). The difference between the change in the scores of the acupressure group subjects from the Gagging Experience subdimension after acupressure compared to before acupressure and the change in the control group subjects was found to be statistically significant ($p < 0.001$).

Table 3 shows the distribution of the participants' mean Nausea-Vomiting-Gagging Occurrence scores according to group. Compared to those of the participants in the acupressure and control groups, the nausea occurrence scores before and after acupressure were not significantly different ($p > 0.05$). In the acupressure group, the change in scores on the nausea occurrence subscale after acupressure compared to before acupressure was not found to be statistically significant ($p > 0.05$). For patients in the con-

Table 2. Distribution of participants' nausea-vomiting-gagging experience mean scores by group.

			Group		Test value
			Experiment (n = 19)	Control (n = 20)	*p*
Nausea Experience	Before intervention	Mean ± SD	5.89 ± 0.88	6.25 ± 0.55	Z: –1.320
		Median (min–max)	6 (4–7)	6 (5–7)	[e] 0.235
	After intervention	Mean ± SD	4.53 ± 0.77	6.1 ± 0.79	Z: –4.580
		Median (min–max)	4 (3–6)	6 (5–8)	[e] 0.001**
	Difference	Mean ± SD	–1.37 ± 0.68	–0.15 ± 0.67	Z: –4.347
		Median (min–max)	–1 (–3–0)	0 (–1–1)	[e] 0.001**
		Test value	Z: –3.841	Z: –1.000	
		p	[f] 0.001**	[f] 0.317	
Vomiting Experience	Before Intervention	Mean ± SD	7.37 ± 1.5	7.15 ± 1.39	Z: –0.575
		Median (min–max)	8 (4–9)	7 (4–9)	[e] 0.588
	After intervention	Mean ± SD	10.63 ± 1.38	7.35 ± 1.14	Z: –5.015
		Median (min–max)	11 (8–12)	7.5 (5–9)	[e] 0.001**
	Difference	Mean ± SD	3.26 ± 1.48	0.2 ± 0.62	Z: –4.910
		Median (min–max)	3 (–1–6)	0 (–1–2)	[e] 0.001**
		Test value	Z: –3.832	Z: –1.414	
		p	[f] 0.001**	[f] 0.157	
Gagging Experience	Before intervention	Mean ± SD	3.37 ± 0.96	3.55 ± 1	Z: –0.559
		Median (min–max)	4 (2–5)	4 (2–5)	[e] 0.607
	After intervention	Mean ± SD	1.32 ± 1.11	3.25 ± 0.85	Z: –4.454
		Median (min–max)	2 (0–4)	3.5 (2–4)	[e] 0.001**
	Difference	Mean ± SD	–2.05 ± 0.71	–0.3 ± 0.66	Z: –4.952
		Median (min–max)	–2 (–3–0)	0 (–2–1)	[e] 0.001**
		Test value	Z: –3.900	Z: –1.897	
		p	[f] 0.001**	[f] 0.058	
Experience Total Score	Before intervention	Mean ± SD	16.63 ± 1.16	16.95 ± 0.83	Z: –1.043
		Median (min–max)	16 (15–19)	17 (16–18)	[e] 0.322
	After intervention	Mean ± SD	16.47 ± 1.54	16.7 ± 0.92	Z: –0.585
		Median (min–max)	16 (12–19)	16.5 (15–18)	[e] 0.607
	Difference	Mean ± SD	–0.16 ± 1.68	–0.25 ± 0.91	Z: –0.721
		Median (min–max)	0 (–5–2)	0 (–2–2)	[e] 0.496
		Test value	Z: –0.120	Z: –1.184	
		p	[f] 0.904	[f] 0.236	

[e] Mann-Whitney U test; [f] Wilcoxon signed rank test; $^{**}p < 0.001$.

trol group, the change in scores on the nausea occurrence subscale after acupressure compared to before acupressure was not found to be statistically significant ($p > 0.05$).

No statistically significant difference was detected between the vomiting induction scores of the patients before acupressure and those of the acupressure and control group participants ($p > 0.05$). The postacupressure vomiting induction scores of the patients in the acupressure group were significantly greater than those of the patients in the control group ($p < 0.001$).

No statistically significant difference was detected between the Gagging Occurrence scores of the subjects before acupressure and those of the participants in the acupressure and control groups ($p > 0.05$). The Gagging occurrence score of the acupressure group subjects after acupressure was significantly lower than that of the control group subjects ($p < 0.001$). In the acupressure group, the mean decrease of 0.79 ± 0.54 points in the scores of the subjects in the Gagging Formation subdimension after acupressure compared to before acupressure was found to be statistically significant ($p < 0.001$).

Table 4 shows the distribution of participants' mean nausea-vomiting-gagging distress scores by group. There was no statistically significant difference between the noise distress scores of the subjects before acupressure and those of the acupressure and control group participants ($p > 0.05$). The noise distress scores of the acupressure group subjects were significantly lower than those of the control group subjects ($p < 0.001$). Among the patients in the acupressure group, the mean decrease in the Nausea Distress score after acupressure was 1.21 ± 0.42 points, which was significantly lower than that before acupressure ($p < 0.001$).

The difference between the change in the vomiting distress subscale scores of the acupressure group patients

Table 3. Distribution of participants' mean scores for nausea-vomiting-gagging occurrence by group.

			Group		Test value
			Experiment (n = 19)	Control (n = 20)	*p*
Nausea Occurrence	Before intervention	Mean ± SD	4.11 ± 0.46	4.3 ± 0.47	Z: –1.258
		Median (min–max)	4 (3–5)	4 (4–5)	[e] 0.351
	After intervention	Mean ± SD	3.95 ± 0.52	4.2 ± 0.7	Z: –1.173
		Median (min–max)	4 (3–5)	4 (3–6)	[e] 0.351
	Difference	Mean ± SD	–0.16 ± 0.5	–0.1 ± 0.64	Z: –0.254
		Median (min–max)	0 (–1–1)	0 (–1–1)	[e] 0.835
		Test value	Z: –1.342	Z: –0.707	
		p	[f] 0.180	[f] 0.480	
Vomiting Occurrence	Before intervention	Mean ± SD	5.26 ± 1.05	5 ± 1.03	Z: –0.977
		Median (min–max)	6 (3–6)	5 (3–6)	[e] 0.380
	After intervention	Mean ± SD	7.58 ± 0.84	5.2 ± 0.95	Z: –5.051
		Median (min–max)	8 (6–8)	5.5 (3–6)	[e] 0.001**
	Difference	Mean ± SD	2.32 ± 0.67	0.2 ± 0.41	Z: –5.713
		Median (min–max)	2 (2–4)	0 (0–1)	[e] 0.001**
		Test value	Z: –4.061	Z: –2.000	
		p	[f] 0.001**	[f] 0.046*	
Gagging Occurrence	Before intervention	Mean ± SD	1.53 ± 0.51	1.65 ± 0.49	Z: –0.775
		Median (min–max)	2 (1–2)	2 (1–2)	[e] 0.513
	After intervention	Mean ± SD	0.74 ± 0.81	1.55 ± 0.51	Z: –3.475
		Median (min–max)	1 (0–3)	2 (1–2)	[e] 0.001**
	Difference	Mean ± SD	–0.79 ± 0.54	–0.1 ± 0.45	Z: –3.945
		Median (min–max)	–1 (–1–1)	0 (–1–1)	[e] 0.001**
		Test value	Z: –3.638	Z: –1.000	
		p	[f] 0.001**	[f] 0.317	
Occurrence Total Score	Before intervention	Mean ± SD	10.89 ± 0.99	10.95 ± 1.0	Z: –0.367
		Median (min–max)	11 (9–13)	11 (9–12)	[e] 0.728
	After intervention	Mean ± SD	12.26 ± 1.05	10.95 ± 1.1	Z: –3.277
		Median (min–max)	12 (11–15)	11 (9–13)	[e] 0.001**
	Difference	Mean ± SD	1.37 ± 0.96	0 ± 0.79	Z: –4.154
		Median (min–max)	1 (0–3)	0 (–1–2)	[e] 0.001**
		Test value	Z: –3.782	Z: 0.000	
		p	[f] 0.001**	[f] 1.000	

[e] Mann-Whitney U test; [f] Wilcoxon signed rank test; *$p < 0.05$; **$p < 0.001$.

after acupressure compared to before acupressure and the change in the scores of the control group patients was found to be statistically significant ($p < 0.001$). The effect size obtained for post hoc power was d = 1.098, and its power was determined to be 91.6%.

The difference between the change in the Gag Distress subscale scores of the acupressure group subjects after acupressure compared to before acupressure and the change in the scores of the control group subjects was found to be statistically significant ($p < 0.001$).

A graph showing the vital signs of the acupressure and control groups on postoperative days 1 and 2 is given in Fig. 2. The changes in blood pressure and body temperature after the intervention in the acupressure group on postoperative days 1 and 2 were found to be significantly lower than those in the control group ($p < 0.001$).

The graphs showing the pain scores, and gas and stool outputs of the acupressure and control groups on postoperative days 1 and 2 are given in Fig. 3. No statistically significant difference was found between the rates of flatulence after acupressure and those of the participants in the experimental and control groups ($p > 0.05$).

On postoperative day 1, in the acupressure group, the 1.47 ± 0.61-unit decrease in pain intensity after acupressure compared to before acupressure was found to be statistically significant ($p < 0.001$). The effect size obtained for post hoc power was d = 2.512, and its power was determined to be 100%. The 2.11 ± 0.46 unit decrease in pain intensity after acupressure in the experimental group on the second postoperative day was found to be statistically significant ($p < 0.001$). In the control group, the change in pain intensity after acupressure compared to before acupressure was not statistically significant ($p > 0.05$).

Table 4. Distribution of mean nausea-vomiting-gagging distress scores by group.

			Group		Test value
			Experiment (n = 19)	Control (n = 20)	*p*
Nausea Distress	Before intervention	Mean ± SD	1.79 ± 0.63	1.95 ± 0.51	Z: –0.930
		Median (min–max)	2 (1–3)	2 (1–3)	[e] 0.444
	After intervention	Mean ± SD	0.58 ± 0.51	1.9 ± 0.45	Z: –5.207
		Median (min–max)	1 (0–1)	2 (1–3)	[e] 0.001**
	Difference	Mean ± SD	–1.21 ± 0.42	–0.05 ± 0.22	Z: –5.681
		Median (min–max)	–1 (–2– –1)	0 (–1–0)	[e] 0.001**
		Test value	Z: –4.065	Z: –1.000	
		p	[f] 0.001**	[f] 0.317	
Vomiting Distress	Before intervention	Mean ± SD	2.11 ± 0.66	2.15 ± 0.49	Z: –0.169
		Median (min–max)	2 (1–3)	2 (1–3)	[e] 0.901
	After intervention	Mean ± SD	3.05 ± 1.08	2.15 ± 0.37	Z: –3.771
		Median (min–max)	3 (0–4)	2 (2–3)	[e] 0.001**
	Difference	Mean ± SD	0.95 ± 1.18	0 ± 0.32	Z: –4.371
		Median (min–max)	1 (–3–2)	0 (–1–1)	[e] 0.001**
		Test value	Z: –2.891	Z: 0.000	
		p	[f] 0.004**	[f] 1.000	
Gagging Distress	Before intervention	Mean ± SD	1.84 ± 0.6	1.9 ± 0.64	Z: –0.276
		Median (min–max)	2 (1–3)	2 (1–3)	[e] 0.813
	After intervention	Mean ± SD	0.58 ± 0.51	1.7 ± 0.47	Z: –4.749
		Median (min–max)	1 (0–1)	2 (1–2)	[e] 0.001**
	Difference	Mean ± SD	–1.26 ± 0.45	–0.2 ± 0.41	Z: –4.993
		Median (min–max)	–1 (–2– –1)	0 (–1–0)	[e] 0.001**
		Test value	Z: –4.021	Z: –2.000	
		p	[f] 0.001**	[f] 0.046*	
Boredom Total Score	Before intervention	Mean ± SD	5.74 ± 0.73	6 ± 0.79	Z: –1.173
		Median (min–max)	6 (4–7)	6 (4–7)	[e] 0.296
	After intervention	Mean ± SD	4.21 ± 1.23	5.75 ± 0.64	Z: –4.506
		Median (min–max)	4 (0–6)	6 (4–7)	[e] 0.001**
	Difference	Mean ± SD	–1.53 ± 1.35	–0.25 ± 0.44	Z: –4.011
		Median (min–max)	–1 (–6–0)	0 (–1–0)	[e] 0.001**
		Test value	Z: –3.588	Z: –2.236	
		p	[f] 0.001**	[f] 0.025*	

[e] Mann-Whitney U test; [f] Wilcoxon signed rank test; *$p < 0.05$; **$p < 0.001$.

According to the experimental and control group participants, no statistically significant difference was detected between the frequency of flatulence before acupressure and that on postoperative day 0 ($p > 0.05$). The incidence of flatulence after acupressure in the experimental group was significantly greater on the second postoperative day than that in the control group ($p = 0.487$; $\chi^2 = 0.975$; $p < 0.001$).

4. Discussion

The results of this study indicate that acupressure applied to the specific acupoints SP6, ST36, PC6, HT7, and LI4 significantly alleviates postoperative pain and improves gastrointestinal function in women who have undergone hysterectomy. The reduction in the severity of pain observed in the acupressure group compared to the control group suggests that acupressure can be an effective non-pharmacological intervention for pain management in postoperative care. This finding is consistent with previous research that highlighted the analgesic effects of acupressure in various clinical settings.

In addition to pain relief, the study demonstrated a significant decrease in mean scores for nausea, vomiting, and retching in the acupressure group. These findings are particularly important because postoperative nausea and vomiting (PONV) are common and distressing complications following surgery that are often exacerbated by the use of opioids for pain management. By reducing the incidence and severity of PONV, acupressure not only enhances patient comfort but also contributes to a smoother and quicker recovery process.

In this study, acupressure applied to the SP6, ST36, PC6, HT7, and LI4 acupoints in women who underwent hysterectomy reduced the severity of pain compared to that in the control group. The mean scores for nausea, vomiting,

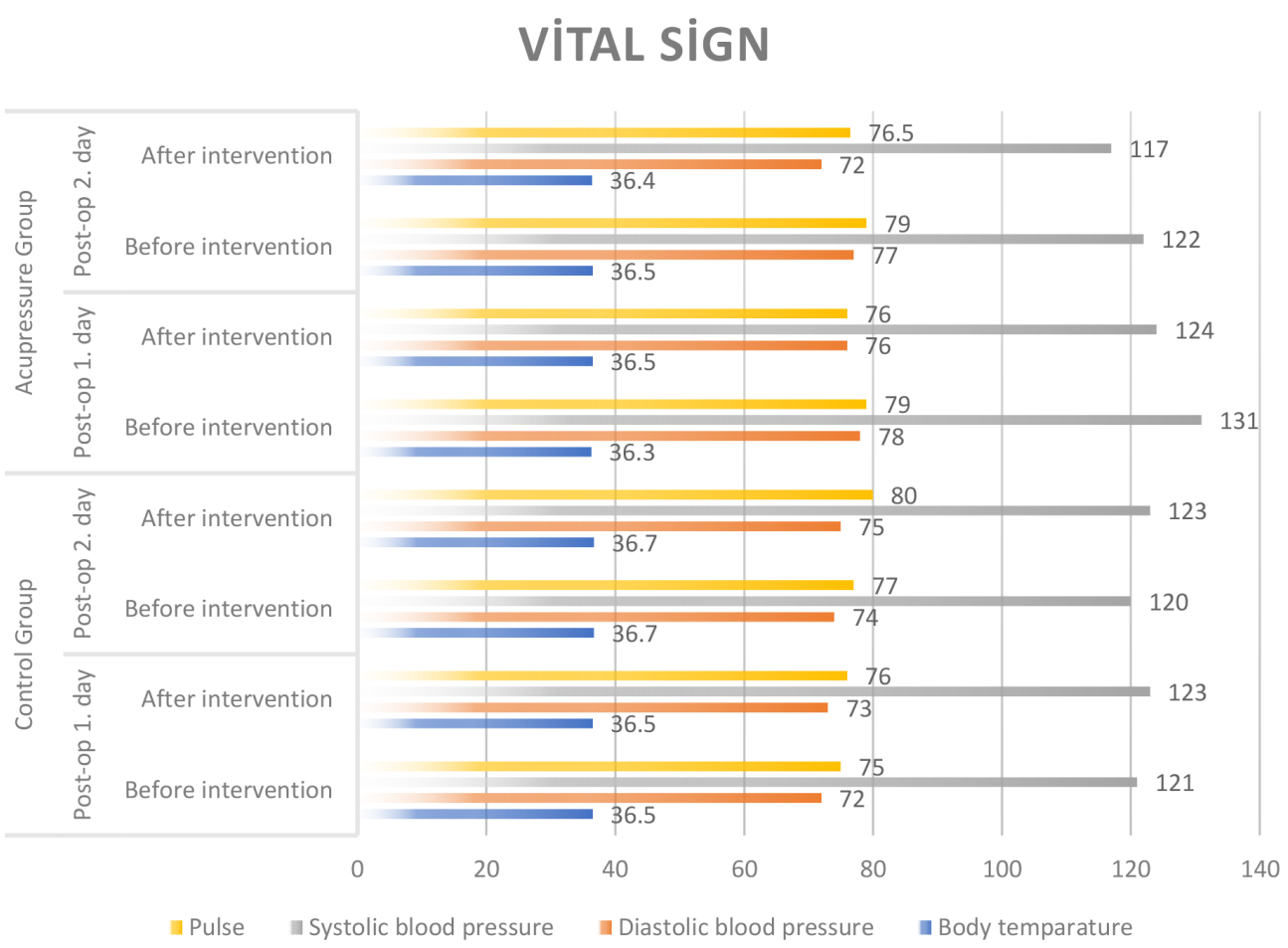

Fig. 2. Participants' vital signs on postoperative days 1 and 2.

and retching were significantly lower ($p < 0.05$). Additionally, the gas output and stool formation in the acupressure group were significantly greater than those in the control group ($p < 0.001$).

These findings align with those of Chang *et al.* (2004) [17], who reported that the time required for the passage of gas and stool was significantly shorter in the acupressure group in which the SP6 point was targeted than in the control group. This finding supports the notion that acupressure can enhance gastrointestinal motility post-surgery [17].

Similarly, Pires *et al.* (2022) [18] reported that the application of acupressure to the postoperative PC6 acupoint before hysterectomy reduced postoperative nausea and the use of antiemetics but did not affect vomiting after hysterectomy. This study's results are in agreement, highlighting the potential of PC6 acupressure for managing postoperative symptoms; however, further larger studies are required to confirm its efficacy when combined with antiemetic agents [18].

Chen *et al.* (2003) [19] demonstrated that acupressure at Neiguan (PC6), Zusanli (ST36), and Sanyinjiao (SP6) significantly increased gastrointestinal motility post-hysterectomy. In the control group, where sham points were used, few changes were observed [19]. This study revealed that acupressure significantly reduced flatulence and improved gastrointestinal function, further corroborating the findings of Chang *et al.* (2004) [17] regarding the effectiveness of acupressure in expediting gas and stool passage.

Liu *et al.* (2023) [20] reported that acupressure at the ST36 point significantly shortened the first gas passage by 6 hours in patients who underwent colorectal cancer surgery. These results are consistent with our study, where acupressure facilitated faster gastrointestinal recovery [20].

In a study by Yin *et al.* (2013) [21], transcutaneous electrical stimulation of acupoints ST36 and ST34 reduced postoperative pain and nausea while improving gastrointestinal function in patients who underwent laparoscopic gynecological surgery. This finding supports the findings of the current study that acupressure can be a beneficial adjunct in postoperative care [21].

Yun and Kim (2015) [22] demonstrated that Korean hand acupressure reduced pain and abdominal distension in patients undergoing laparoscopic surgery. These findings support the current study's evidence of the effectiveness of acupressure in reducing postoperative pain and enhancing gastrointestinal function [22].

Abadi *et al.* (2017) [23] reported increased intestinal motility and reduced gas and stool passage time when acu-

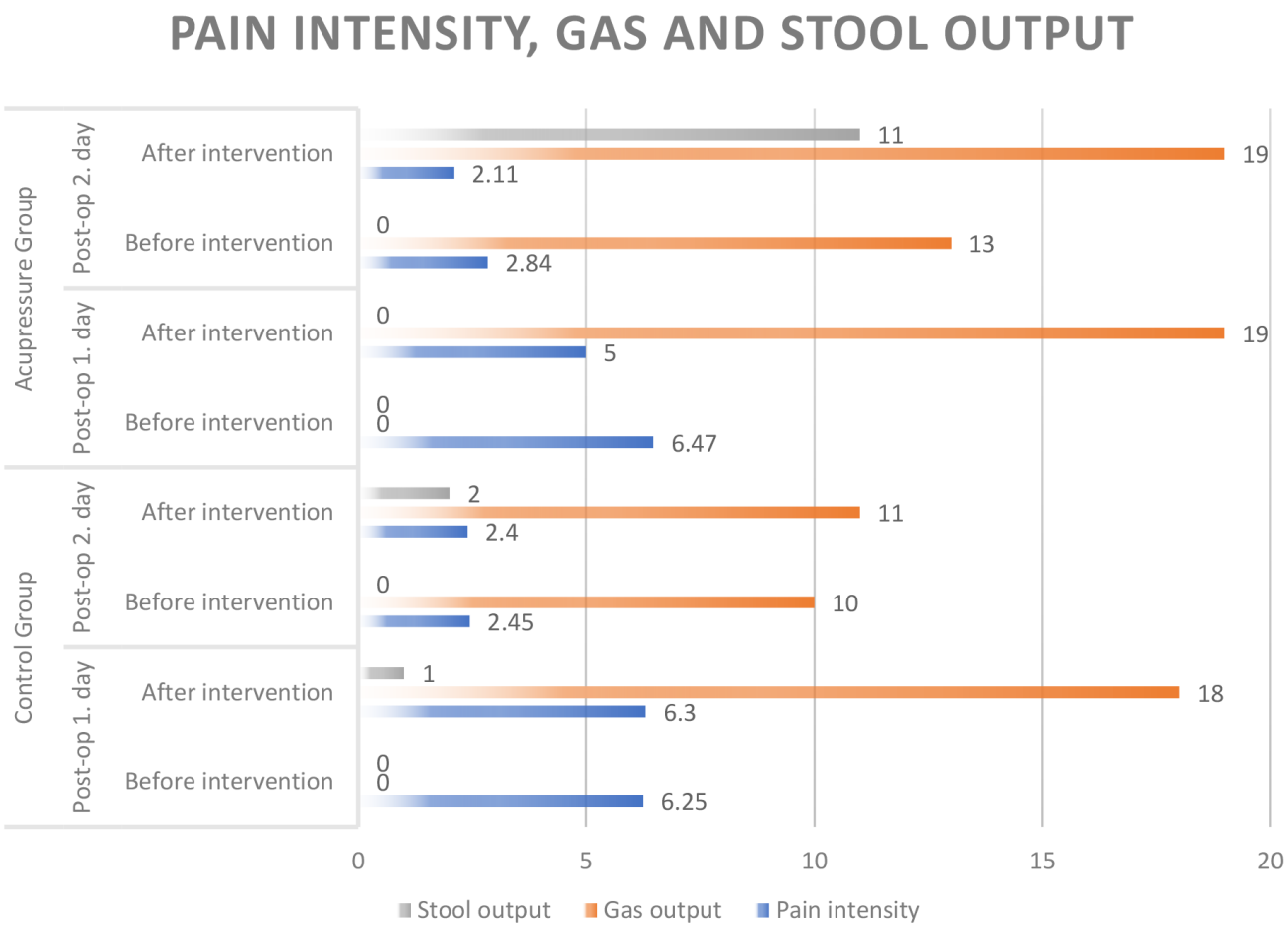

Fig. 3. Participants' pain scores, and gas and stool output on postoperative days 1 and 2.

pressure was applied to the ST36 and LI4 points postcesarean section, further supporting the conclusions of the present study about the efficacy of acupressure in enhancing gastrointestinal recovery.

Overall, while numerous studies have focused on the effects of acupressure on labor pain, chemotherapy-induced nausea, and pregnancy-related nausea, there is a clear need for more research on its impact on postoperative symptoms in gynecological surgeries. This study contributes to the growing body of evidence showing that acupressure is effective in reducing pain, and nausea, and improving gastrointestinal function post-hysterectomy.

Furthermore, the results showed that participants in the acupressure group experienced significantly greater gas output and stool formation than did those in the control group. This suggests that acupressure may facilitate the restoration of normal gastrointestinal motility, which is often impaired after abdominal surgeries such as hysterectomy. The stimulation of specific acupoints could enhance gastrointestinal function by promoting peristalsis and reducing gastrointestinal stasis, thereby reducing the duration of postoperative ileus.

Overall, this study provides compelling evidence that acupressure is a beneficial adjunct therapy for managing postoperative symptoms in women undergoing hysterectomy. The non-invasive nature and low-risk profile of acupressure make it an attractive option for enhancing postoperative care. Future studies could further explore the mechanisms underlying the observed effects and investigate the long-term benefits of incorporating acupressure into standard postoperative care protocols.

In conclusion, acupressure significantly reduces pain and PONV while improving gastrointestinal function in the postoperative period following hysterectomy. These findings support the integration of acupressure into holistic postoperative care strategies to improve recovery and patient outcomes. In this study, acupressure applied to the SP6, ST36, PC6, HT7, and LI4 acupoints in women who underwent hysterectomy reduced the severity of pain compared to that in the control group, and mean nausea, vomiting, and retching experience scores were lower ($p < 0.05$). In addition, after acupressure, the gas output and stool formation of the participants in the acupressure group were significantly greater than those in the control group ($p < 0.001$).

4.1 Strengths of the Study

The use of a randomized controlled design strengthens the validity of the findings by minimizing bias and confounding factors. This study assessed multiple outcomes, including pain, nausea, vomiting, gas output, and stool formation, providing a holistic view of the effects of acupressure. The selection of well-established acupoints (SP6, ST36, PC6, HT7, and LI4) based on previous research supports the relevance and potential efficacy of the intervention. Non-Pharmacological Approach: This study highlights the benefits of a non-pharmacological intervention that can be particularly valuable for patients who prefer or require alternatives to medication. The study adhered to ethical standards, ensuring informed consent and respecting patient privacy, which enhanced the credibility of the research.

4.2 Limitations of the Study

The study was conducted in a single hospital and included only women who underwent hysterectomy, limiting the generalizability of the findings to other populations and settings. The sample size was relatively small, which may limit the statistical power and the ability to detect smaller effects. This study focused on short-term outcomes, and the long-term effects of acupressure on postoperative recovery were not assessed. Despite the randomized design, there may still be potential biases, such as placebo effects or the influence of participant expectations, that could affect the results. Variability in the intervention of acupressure, such as differences in pressure applied or duration, may impact the consistency and reproducibility of the results. Data collection starting after the coronavirus disease 2019 (COVID-19) outbreak may have influenced the study's conduct and participant behavior, introducing an additional variable that could affect the findings.

4.3 Future Study Suggestions

Future studies should involve larger sample sizes to increase the statistical power and generalizability of the findings. The long-term effects of acupressure on postoperative recovery, including pain management, gastrointestinal function, and overall quality of life, were investigated. Mechanistic studies should be conducted to better understand how acupressure influences physiological processes, particularly gastrointestinal motility and pain perception. The effectiveness of acupressure was compared with that of other non-pharmacological interventions, such as acupuncture, transcutaneous electrical nerve stimulation (TENS), and massage therapy. The effectiveness of acupressure in different surgical populations and types of surgeries beyond hysterectomy, such as cesarean sections, appendectomies, and laparoscopic procedures, was explored. The combined effect of acupressure combined with pharmacological treatments should be evaluated to determine whether it can reduce the required dosages of medications and the associated side effects. Standardized acupressure protocols should be developed to ensure consistency in the intervention of this technique across different studies and clinical settings. Patient-reported outcomes of satisfaction and quality of life were included to provide a more comprehensive assessment of the benefits of acupressure. Cost-effectiveness analyses were conducted to determine the economic benefits of incorporating acupressure into standard postoperative care protocols.

5. Conclusions

Hysterectomy is a significant gynecological procedure with notable postoperative challenges, including pain, nausea, vomiting, and delayed gastrointestinal function. This study confirmed that acupressure, a non-pharmacological intervention, effectively reduces these complications, thereby improving the quality of postoperative care and potentially reducing hospital stays. Encouraging the use of acupressure among nurses could lead to reduced reliance on pharmacological interventions.

Availability of Data and Materials

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions

Idea and design: YYV, MY. Data collection: MY. Data analysis and interpretation: YYV, MY. Article writing: YYV, MY. Critical review: YYV, MY. Both authors read and approved the final manuscript. Both authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

Permission for the study was obtained from the Scientific Research and Publication Ethical Board of Istanbul Medipol University (decision dated 08.05.2021 and numbered 813). In addition, ClinicalTrials.gov (NCT06340776) was used. All participants were informed about the research, and written and verbal consent was obtained from the women.

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Conflict of Interest

The authors declare no conflict of interest.

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