



Effects of lavender essential oil for colorectal cancer patients with permanent colostomy on elimination of odor, quality of life, and ostomy adjustment: A randomized controlled trial

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ABSTRACT

Purpose: To examine the effects of the addition of lavender essential oil to the colostomy bag of the patients with permanent colostomy on the elimination of odor, quality of life, and ostomy adjustment.

Methods: As a parallel group, single-blinded randomized controlled trial with repeated measures, this study was conducted between November 2016 and February 2018. Patients with a permanent colostomy that had opened at least three months before the study were stratified according to age and sex and were randomized according to days of week. The study sample included 15 patients in the experimental group and 15 in the control group. Patients in the experimental group used lavender essential oil in the ostomy bag, and patients in the control group continued their routine practices about nutrition and stoma care for 1 month.

Results: There were no statistically significant differences in demographic characteristics between the experimental and control groups ($p > 0.05$). As compared with the control group patients, the experimental group patients who used lavender essential oil in the ostomy bag experienced statistically significant less odor, a higher quality of life, and better adjustment to ostomy (all $p < 0.05$).

Conclusions: The use of lavender essential oil in the ostomy bag is a simple, low-cost, easy-to-use, and natural method that is effective for increasing both ostomy adjustment and quality of life levels and for eliminating odor in permanent colostomy patients.

1. Introduction

Colorectal cancer is the third most common cancer in the world (Ferlay et al., 2012). Resection as a surgical treatment, radiotherapy, and/or chemotherapy are used in the treatment of colorectal cancer. After resection, end-to-end anastomosis or colostomy is performed based on the location of the carcinoma (Cotrim and Pereira, 2008; Ferlay et al., 2012; Danielsen et al., 2013; Luo et al., 2014; Ambe et al., 2018). The GLOBOCAN project of the International Agency for Research on Cancer (IARC) reported that there have been 21% incidences related to colorectal cancer in 2018 in Turkey (IARC, 2018). Although data on the number of colostomy cases in Turkey are insufficient, a multi-centered one-year follow-up study of Karadag et al. (2015) found that 54.1% of patients ($n = 135$) received colostomy.

According to the results of studies in the literature, stoma may cause many problems in physical, social, cognitive, and emotional aspects of an individual's life (Cotrim and Pereira, 2008; Pinquart and Duberstein,

2010; Grant et al., 2013; Lim et al., 2015). These include physical problems such as changes in defecation habits, loss of defecation control, uncontrolled flatulence, and odor; psychological problems such as anxiety, depression, suicidal ideation, loneliness, and reduced self-esteem; and social and economic problems such as resigning a job after the operation, changing jobs, less conversation with close friends and relatives, increasing marital problems, rejection by family and friends, and limiting social activities (Pinquart and Duberstein, 2010; Grant et al., 2013; Hoon et al., 2013; Lim et al., 2015). These problems can negatively affect the ostomy adjustment (OA) process, including living with a stoma and quality of life (QoL; Baxter et al., 2006; Celasin et al., 2011; Hoon et al., 2013; Lim et al., 2015). One identified major problem is odor due to uncontrolled flatulence and defecation which causes social isolation, decline in interpersonal relations, and decrease in self-esteem (Cotrim and Pereira, 2008; Grant et al., 2013; Lim et al., 2015). In a study by Celasin et al. (2011), 46.0% of patients stated that they were worried about odor. To reduce odor caused by uncontrolled

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gas and stool output in individuals with colostomy, restriction of nutrients that increase gas and odor and use of a filtered colostomy bag are recommended (Martinson et al., 2004; Luo et al., 2014). However, these measures are insufficient to eliminate odor, and patients complain about odor caused by uncontrolled gas and stool output (Annells, 2006; Lynch et al., 2008; Celasin et al., 2011).

For many years, lavender essential oil has been used for various reasons, including to create fragrance, for faster wound healing (eg, on mucosal areas such as recurrent aphthous lesions and episiotomy), and for its antibacterial and anxiolytic properties (Lusby et al., 2006; Jones, 2011; Vakilian et al., 2011; Altaei, 2012; Sheikhan et al., 2012; Baccaglioni, 2013; Koca-Kutlu et al., 2013). However, to the best of our knowledge, in the literature there is no study on the use of lavender essential oil for eliminating odor in individuals with permanent colostomy.

We hypothesized that as a simple, low-cost, easy-to-use, and natural method, the use of lavender essential oil in a colostomy bag would effectively increase both OA and QoL levels and eliminate odor in permanent colostomy patients. To test this hypothesis, we examined the effects of the addition the lavender essential oil to the colostomy bag on the elimination of odor, QoL, and OA in permanent colostomy patients.

2. Method

2.1. Study design

This study was conducted as a parallel group, single-blinded randomized controlled trial with repeated measures between November 2016 and February 2018. The participants were recruited from two Public Training and Research Hospitals' (they are coded as "A" and "O" in Table 1) General Surgery Clinics in Turkey. The sample in this study

Table 1
Descriptive characteristics of participants.

Descriptive Characteristic	Experimental (n = 15)	Control (n = 15)	p-value
	n (%)	n (%)	
Age (year)			
(Mean ± SD)	59.6 ± 9.694	58.3 ± 9.582	0.722 ^b
40-64	9 (60.0)	11 (73.3)	
≥ 65	6 (40.0)	4 (26.7)	0.896 ^a
Sex			
Female	5 (33.3)	5 (33.3)	
Male	10 (66.7)	10 (66.7)	1.000 ^a
Employed			
Yes	4 (26.7)	7 (46.7)	
No	11 (73.3)	8 (53.3)	0.450 ^d
Hospital			
A	6 (40.0)	8 (53.3)	
O	9 (60.0)	7 (46.7)	0.715 ^d
Type of colostomy			
Hartmann's	–	4 (26.7)	–
Miles'	15 (100.0)	11 (73.3)	0.099 ^a
Firm of ostomy products			
Firm I	7 (46.7)	7 (46.7)	
Firm II	5 (33.3)	2 (13.3)	
Firm III	3 (20.0)	6 (40.0)	0.319 ^c
Emptying the bag			
Yes	5 (33.3)	10 (66.7)	
No	10 (66.7)	5 (33.3)	0.143 ^d
Bag-changing frequency			
Once a day	6 (40.0)	9 (60.0)	0.439 ^c
Once in two days	7 (46.7)	5 (33.3)	0.564 ^c
Twice a day	2 (13.3)	1 (6.7)	0.564 ^c
Duration of having the colostomy (years)			
(mean ± SD)	7.0 ± 6.190	3.8 ± 1.598	0.069 ^b

^a Fisher's exact tests.

^b Independent samples *t*-test.

^c Pearson chi-square test.

^d Yates chi-square test.

included patients with an opened permanent colostomy at least three months before study initiation. According to literature, the average time of adjusting to life with a stoma in terms of both physical and psychosocial aspects is three months (Raudonyte et al., 2010; Danielsen and Rosenberg, 2014; Ohlsson-Nevo et al., 2013; Karabulut et al., 2014; Bowyer and Royse, 2016).

The inclusion criteria for this study included older than 18 years, without a mental or communication problem, had permanent colostomy, no complications due to stoma, not receive chemotherapy during the study, no discomfort from the smell of lavender essential oil, absence of allergy to lavender essential oil, residing in the city in which the study was conducted, and volunteered to participate. The patients were excluded if they were using any product in the stoma bag to prevent odor formation, residing in other cities rather than the city in which the study was conducted, and had late complications of ostomy like prolapse, parastomal hernia, stenosis, obstruction, peristomal skin problems, stomal fistula, metabolic complications.

2.2. Sample size

A pilot study was conducted to determine the sample size with 10 patients from the experimental group and 10 patients from the control group. Sample size calculation was performed using the Number Cruncher Statistical System (NCSS)–Power Analysis and Sample Size (PASS) software. Based on the differences in the mean scores of the QoL and OA scales obtained from the patients in the pilot study, the alpha level was set at 0.05 and power as 80%. Thus, 15 patients were included in each group.

2.3. Randomization and blinding

Patients fulfilling the inclusion criteria and who agreed to participate in the study were stratified according to age and sex and were randomized at the beginning of the study by researchers according to days: odd days for experimental group and even days for the control group. After randomization, chi-square test was used to verify the homogeneity of experimental and control groups according to age and sex. There was no statistically significant difference in age or gender between the groups ($p > 0.05$; Table 1).

2.4. Study instruments

2.4.1. Primary outcome: odor

Those patients in the experimental and control groups answering the question (Do you think odor is a problem for you related to your colostomy?) by saying "yes" or "no" were recorded by the researcher.

2.4.2. Secondary outcomes

Secondary outcomes included QoL and OA of patients.

2.4.2.1. Stoma quality of life scale (SQOLS). The SQOLS was developed to assess QoL in patients with ostomy by Baxter et al. (2006), and consists of a 21-item questionnaire: 19 items are scored using a Likert-type 5-point frequency scale, and 2 items measure overall life satisfaction on a scale from 0 to 100. Three domains were identified for the instrument: work/social function (6 items), sexuality/body image (5 items), and stoma function (6 items). Two items were not assigned to a specific scale but were included because they measure unique and important content: one item measures financial concerns with respect to stoma care, and one item measures the degree of skin irritation. The scale's Cronbach's alpha is 0.87. The Turkish validity and reliability study of the scale was conducted by Karadag et al. (2011a).

2.4.2.2. Ostomy adjustment Inventory–23 (OAI-23). The OAI-23 is designed to assess psychosocial adjustment in patients with ostomy and consists of 23 items, was developed by Simmons et al. (2009). This

scale consists of 4 subfactors, including acceptance (items 1, 3, 4, 6, 9, 14, 15, 19, 23), anxious/preoccupation (items 12, 13, 17, 20, 21), social engagement (items 5, 7, 8, 11), and anger (items 2 and 10) subdimensions. In addition, 3 items were not included in any subfactors. Each item is measured on a 5-point Likert scale (0–4), with higher scores indicating better adjustment. Twelve of the items (items 2, 5, 7, 8, 10, 11, 12, 13, 16, 17, 18, 21) are negatively phrased and therefore reverse scored. The scale's Cronbach's alpha is 0.874. The Turkish validity and reliability study of the scale was conducted by Karadag et al. (2011b).

2.5. Data collection methods

To collect the data, an introductory information questionnaire was used, which was developed in accordance with the literature (Hoon et al., 2013; Karadag et al., 2015; Cengiz and Bahar, 2017), the SQOLS (Baxter et al., 2006), and OAI-23 (Simmons et al., 2009). An information sheet that was developed in accordance with the literature and provided advice on preventing excess gas formation, nutritional recommendations for reducing odor, and included information about daily fluid consumption were given both experimental and control group patients (Martinson et al., 2004; Hooper and Gutman, 2017). A training brochure was provided to the experimental group patients explained how to use lavender essential oil in the ostomy bag. Patients who were able to participate were phoned and invited to the clinic for the study. Patients who stated that they could not come to the hospital were interviewed in their homes or at their workplaces. The hospital interviews were conducted on the same day as the follow-up examinations of the patients, and no fee was paid to the participants. The data were collected through face-to-face interviews from patients who agreed to participate in the study in accordance with informed consent.

2.6. Procedures

The implementation steps for both the experimental group and the control group in the first (at the baseline) assessments were listed below:

- The descriptive information questionnaire was filled out by the researcher using information provided by the patients themselves and their medical records.
- The SQOLS and OAI-23 were filled out by patients under the guidance of the researcher, and patients were asked about their experience of odor problems.
- The information sheet provided guidance to the patients on nutritional recommendations to reduce odor caused by uncontrolled gas and stool output and preventing excess gas formation.

The implementation steps for both the experimental group and the control group in the second (1-month after from the first assessment) assessment were listed below:

- Patients were again asked about their experience of odor problems.
- The SQOLS and OAI-23 were once again completed by patients under the guidance of the researcher.
- The patients were informed that the study was ended.

2.6.1. Specific implementation steps for experimental group

The implementation steps for the experimental group in the first (at the baseline) assessment were listed below:

- A drop of lavender essential oil was placed on the inside of the patients' anterior arm, and patients were watched for development of a local reaction.
- The patients were provided a training continuing average of 15 min by using the brochure that included information how to apply 10

drops of lavender essential oil into the clean bag during colostomy bag exchange and spreading the oil around the entire inner surface of the bag, and their routine practices about nutrition and stoma care. First, this step was demonstrated by the researcher, and then the patients were requested to perform the same implementation under the supervision of the researcher.

- One-month supply of lavender essential oil was provided to the patients in the experimental group.

2.6.2. Specific implementation steps for control group

The implementation steps for the control group in the first (at the baseline) assessment were listed below:

- Patients were instructed to continue their routine practices about nutrition and stoma care for one month.

2.7. Data analysis

In this study, frequency, percentage, mean, and standard deviation were used as descriptive statistics. Based on the Kolmogorov-Smirnov normality test for the subdimension and total scores of the SQOLS and OAI-23, it was concluded that the parameters were normal ($p > 0.05$). For this reason, independent-samples *t*-test was used for baseline intergroup statistics as parametric tests, and chi-square was used as the nonparametric test for rates to determine whether there were any significant differences in expressing odor as a problem between the patients in the experimental and control groups. Analysis of covariance (ANCOVA) was used to compare the SQOLS and OAI-23 scores between groups.

2.8. Ethical approval

This study was approved by a University's Clinical Research Ethics Committee (28/05/2015–99950669/140) in Ankara. Informed consent was provided by all participants. All study procedures were conducted in accordance with the Declaration of Helsinki (The World Medical Association, 2017).

3. Results

A total of 390 patients were assessed for eligibility: 168 participants did not meet the inclusion criteria, 65 participants declined to participate, 24 participants died before the study, and 99 patients could not be contacted because of incorrect phone numbers in hospital records. Thirty-four patients met the inclusion criteria and were consented and randomized into the study. One participant from the experimental group discontinued the intervention because of the decision to undergo adjuvant chemotherapy in routine follow-up. One participant from the control group was lost to follow-up because of peristomal skin irritation, and two participants discontinued the intervention because of the decision to undergo adjuvant chemotherapy in routine follow-up. Fig. 1 illustrates inclusion, group allocation, and follow-up of participants in accordance with the CONSORT guidelines. Data were analyzed for 15 patients in the experimental group and 15 patients in the control group.

3.1. Participant characteristics

Descriptive data of the primary and secondary outcomes at all data collection time points are provided in Table 1. There was no statistically significant difference between the experimental and control groups in terms of descriptive characteristics ($p > 0.05$). Although it is not shown in the table, in the first assessment, 7 patients from the experimental group and 11 patients from the control group were interviewed in their homes, 1 patient from the experimental group and 1 patient from the control group were interviewed at their workplaces, and 7 patients from the experimental group and 3 patients from the control

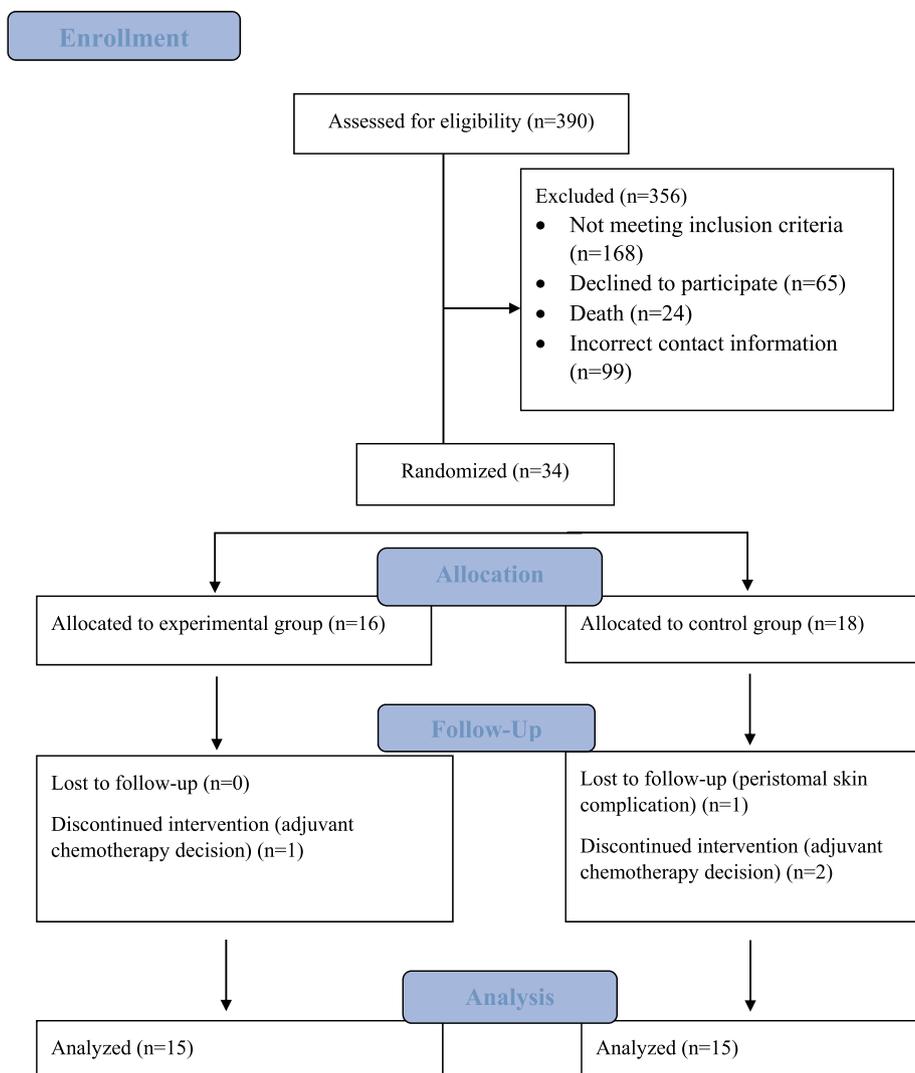


Fig. 1. Flow diagram.

group were interviewed at the hospital. There was no statistically significant difference between the experimental and control groups in terms of the interview place in the first assessment ($p > 0.05$). In the second assessment, 11 patients from the experimental group and 11 patients from the control group were interviewed in their homes, 2 patients from the experimental group and 1 patient from the control group were interviewed at their workplaces, and 2 patients from the experimental group and 3 patients from the control group were interviewed at the hospital. There was no statistically significant difference between the experimental and control groups in terms of the interview place in the second assessment ($p > 0.05$).

3.2. Experience of odor

Data on the experience of odor in the primary and secondary outcomes at all data collection time points are provided in Table 2. In the first assessment, there was no statistically significant difference between the experimental and control groups in terms of the experience of odor ($p > 0.05$), but in the second assessment, the experimental group patients experienced statistically significant fewer odor problems in terms of intergroup but also intragroup outcomes ($p < 0.05$). In the first assessment, all patients in the experimental group stated that they had odor problems, but in the second assessment, all stated that the odor problem was eliminated. However, 93.3% of the patients in the control group stated that they had problems due to odor in both the first

Table 2
Expressing odor as a problem.

Odor Problem	First Assessment		p-value	Second Assessment		p-value
	Yes	No		Yes	No	
	n (%)	n (%)	n (%)	n (%)		
Experimental (n = 15)	15 (100.0)	0 (0)	1.000 ^a	0 (0)	15 (100.0)	0.000 ^b
Control (n = 15)	14 (93.3)	1 (6.7)		14 (93.3)	1 (6.7)	

^a Fisher's exact tests.

^b Yates chi-square test.

and second assessments.

3.3. QoL

In the first assessment of QoL, there was no statistically significant difference between the experimental and control groups in terms of overall life satisfaction, work/social function, sexuality/body image, and stoma function subdimensions and general QoL ($p > 0.05$). In Table 3, ANCOVA was used to examine if the using lavender essential oil in the colostomy bag had an effect on quality of life between groups.

Table 3
Comparison of quality of life mean scores between experimental and control groups using ANCOVA (n = 30).

QoL Scores	First Assessment		Second Assessment		F	p-value ^a
	Experimental (n = 15)	Control (n = 15)	Experimental (n = 15)	Control (n = 15)		
	$\bar{X} \pm SS$ (95% CI)	$\bar{X} \pm SS$ (95% CI)	$\bar{X} \pm SS$ (95% CI)	$\bar{X} \pm SS$ (95% CI)		
Overall life satisfaction	71.3 ± 15.976 (59,229 - 83,437)	54.0 ± 30.659 (41,896 - 66,104)	74.0 ± 14.540 (61,896 - 86,104)	55.3 ± 27.996 (43,229 - 67,437)	8.875	0.004 ^a
Work/social function	59.6 ± 19.772 (49,624 - 69,762)	49.9 ± 20.544 (39,884 - 60,022)	65.2 ± 16.796 (55,171 - 75,309)	44.6 ± 20.511 (34,611 - 54,749)	9.085	0.004 ^a
Sexuality/body image	53.3 ± 17.078 (44,482 - 62,185)	46.3 ± 13.425 (37,482 - 55,185)	61.6 ± 19.334 (52,815 - 70,518)	44.0 ± 18.047 (35,149 - 52,851)	7.791	0.007 ^a
Stoma function	41.3 ± 21.331 (30,294 - 52,439)	43.1 ± 21.191 (32,061 - 54,206)	51.3 ± 23.660 (40,274 - 62,419)	38.8 ± 19.213 (27,788 - 49,932)	0.940	0.336 ^a
General quality of life	299.6 ± 63.019 (263,239–336,094)	248.7 ± 86.597 (212,326 - 285,181)	326.2 ± 67.049 (289,826 - 362,681)	253.5 ± 62.239 (217,113–289,967)	11.555	0.001 ^a

CI: Confidence Interval.

^a F score is from Analysis of Covariance (ANCOVA) with group scores as covariates.

Overall life satisfaction subdimension scores increased by 2.7 ± 1.436 points in the experimental group, and those of overall life satisfaction subdimension scores in the control group were slightly increased (1.3 ± 2.663 points). These findings showed that there was a significant difference between the experimental and control groups (F = 8.875; p < 0.05). Mean work/social function subdimension scores increased by 5.6 ± 2.976 points in the experimental group, whereas scores in the control group decreased by 5.3 ± 0.33 points. These findings reported that there was a significant difference between the experimental and control groups (F = 9.085; p < 0.05). Sexuality/body image subdimension scores increased by 8.3 ± 2.256 points in the experimental group patients, whereas scores in the control group decreased by 2.3 ± 4.622 points. These findings showed that there was a significant difference between the experimental and control groups (F = 7.791; p < 0.05). Mean general quality of life scores increased by 26.6 ± 4.03 points in the experimental group while it increased by 4.8 ± 24.358 points in the control group. These findings represented that there was a significant difference between the experimental and control groups (F = 11.555; p < 0.05).

3.4. OA

In the first assessment of OA, although there was no statistically significant difference between groups in terms of mean scores in the anxious/preoccupation, social engagement, and anger subdimensions (p > 0.05), the mean scores of the acceptance subdimension (t = 3.434; p = 0.002) and general OA (t = 2.160; p = 0.039) were

found to be statistically significantly higher in the experimental group than in the control group (p < 0.05). In Table 4, ANCOVA was used to examine if using lavender essential oil in the colostomy bag had an effect on ostomy adjustment between groups. Acceptance subdimension mean scores increased from 26.0 ± 4.105 points to 26.2 ± 5.216 points in the experimental group and those of acceptance subdimension mean scores in the control group were increased from 20.0 ± 5.284 to 21.2 ± 5.548 points. These findings showed that there was a significant difference between the two groups (F = 17.447; p < 0.05). Mean anxious/preoccupation subdimension scores increased by 2.7 ± 0.115 points in the experimental group, whereas scores in the control group decreased by 1.3 ± 1.096 points. These findings reported that there was a significant difference between the experimental and control groups (F = 4.683; p < 0.05). Social engagement subdimension increased by 0.7 ± 0.121 points in the experimental group patients, whereas scores in the control group decreased by 0.7 ± 0.286 points. These findings presented that there was a significant difference between the experimental and control groups (F = 11.427; p < 0.05). Mean anger subdimension scores increased by 1.0 ± 0.624 points in the experimental group, whereas scores in the control group were unchanged. These findings showed that there was a significant difference between the experimental and control groups (F = 5.644; p < 0.05). General ostomy adjustment mean scores increased by 5.8 ± 2.072 points in the experimental group and slightly increased in the control group by 0.1 ± 3.05 points. These findings reported that there was a significant difference between the experimental and control groups (F = 18.932; p < 0.05).

Table 4
Comparison of ostomy adjustment mean scores between experimental and control groups using ANCOVA (n = 30).

OA Scores	First Assessment		Second Assessment		F	p-value ^a
	Experimental (n = 15)	Control (n = 15)	Experimental (n = 15)	Control (n = 15)		
	$\bar{X} \pm SS$ (95% CI)	$\bar{X} \pm SS$ (95% CI)	$\bar{X} \pm SS$ (95% CI)	$\bar{X} \pm SS$ (95% CI)		
Acceptance	26.0 ± 4.105 (23,378 - 28,622)	20.0 ± 5.284 (17,445 - 22,688)	26.2 ± 5.216 (23,645 - 28,888)	21.2 ± 5.548 (18,645 - 23,888)	17.447	0.000 ^a
Anxious/preoccupation	8.6 ± 3.247 (6,656 - 10,544)	8.5 ± 4.764 (6,589 - 10,477)	11.3 ± 3.132 (9,389 - 13,277)	7.2 ± 3.668 (5,256 - 9,144)	4.683	0.035 ^a
Social engagement	8.4 ± 2.899 (6,926 - 10,007)	6.5 ± 3.136 (4,993 - 8,074)	9.1 ± 3.020 (7,593 - 10,674)	5.8 ± 2.850 (4,326 - 7,407)	11.427	0.001 ^a
Anger	4.2 ± 2.455 (3,132 - 5,268)	3.4 ± 2.099 (2,399 - 4,535)	5.2 ± 1.831 (4,199 - 6,335)	3.4 ± 1.807 (2,399 - 4,535)	5.644	0.021 ^a
General ostomy adjustment	55.0 ± 11.259 (49,143 - 60,990)	45.0 ± 13.951 (39,143 - 50,990)	60.8 ± 9.187 (54,943 - 66,790)	45.1 ± 10.901 (39,210 - 51,057)	18.932	0.000 ^a

CI: Confidence Interval.

^a F score is from Analysis of Covariance (ANCOVA) with group scores as covariates.

4. Discussion

Individuals with colostomy have many difficulties because of the concern about unpleasant odor from their stomas, which causes a decrease in social and psychological aspects of their QoL (Annells, 2006; Lynch et al., 2008; Grant et al., 2013). The findings of this study claim that using lavender essential oil in the colostomy bag for colorectal cancer patients with permanent colostomy can eliminate the odor, raise the QoL, and OA. To the best of our knowledge, this study is the first randomized controlled trial to examine the efficacy of lavender essential oil for colorectal cancer patients with permanent colostomy on elimination of odor, QoL, and OA.

4.1. Experience of odor

According to the findings of our study, there was no statistically significant difference between the experimental and control groups in terms of the experience of odor in the first assessment ($p > 0.05$), but in the second assessment, it was found that the experimental group patients experienced statistically significantly fewer odor problems in intergroup and intragroup evaluations ($p < 0.05$; Table 2). In the first assessment, all patients in the experimental group stated that they had odor problems, but in the second assessment, all stated that the odor problem was eliminated at varying rates. However, 93.3% of the patients in the control group stated that they had problems due to odor in both the first and second assessments (Table 2). In a study conducted by Annells (2006), many patients stated that they were not normal, smelled, had no choice, and constantly experienced gas. In a study by Çakmak et al. (2010), 53.5% of the spouses of individuals with colostomy stated that the primary concern about colostomy care was the odor. In accordance with the results of our study, using lavender essential oil in the colostomy bag and informing the individuals with permanent colostomy about odor-preventive measures was effective in dealing with odor problems.

4.2. QoL

Studies have presented that patients' QoL is negatively affected after stoma surgery (Annells, 2006; Cotrim and Pereira, 2008; Hoon et al., 2013; Ambe et al., 2018; Huang et al., 2018). When the QoL scores of the patients included in our study were examined, it was observed that all QoL scores of the experimental group patients increased in the second assessment and that the control group had decreased generally (Table 3). When the literature is examined, it is seen that odor-eliminating interventions and education increase the QoL of individuals with colostomy (Cheng et al., 2012; Hoon et al., 2013; Zhang et al., 2013). In the study conducted by Huang et al. (2018), it was found that the patients who were given stoma care nursing services by phone follow-up once a week in order to increase psychosocial adjustment and give dietary recommendations QoL scores of the experimental group patients were found statistically significantly higher than the patients who received standard nursing care. A systematic review by Danielsen et al. (2013) found that education significantly increased the competence of stoma management, level of knowledge associated with the stoma, and psychosocial adjustment to life with a stoma. In the literature, there is no study on the use of lavender essential oil in the ostomy bag for the prevention of odor in individuals with stoma. It can be said that in accordance with the results of our study, informing individuals with permanent colostomy about odor-preventive measures and using lavender essential oil in the colostomy bag may increase QoL and levels of overall life satisfaction as well as decrease problems related to work, social function, sexuality, body image, and stoma function.

4.3. OA

According to the literature, patients have trouble in adjusting to

their new lives after stoma surgery (Annells, 2006; Cotrim and Pereira, 2008; Ambe et al., 2018; Hoon et al., 2013). In our study, general OA scores of the experimental group patients increased statistically significantly in the second assessment ($p < 0.05$), and scores of the control group had decreased or were unchanged (Table 4). When the literature is examined, it is seen that counseling and education increase patient OA (Cheng et al., 2012; Hoon et al., 2013; Zhang et al., 2013). However, attempts to increase OA were determined to be limited with counseling and training. In the study conducted by Cheng et al. (2012), comprehensive training was given to patients, and it was found that the total OA scores increased statistically significantly after the training ($p < 0.01$). In another study conducted by Karadag et al. (2015), counseling and education were given to patients, and OA was measured after stoma surgery at the first and sixth months. In the second measurement, although not statistically significant ($p > 0.05$), the OA of the patients increased. In a study by Zhang et al. (2013), which investigated the effect of postoperative telephone follow-up by enterostomal nurse on the postoperative adjustment of discharged colostomy patients, participants in the study group had significantly better OA, higher stoma self-efficacy, higher satisfaction with care, and fewer stoma complications compared with those in the control group. It was found in our study that the mean score of general OA in the experimental group was higher than the mean scores of general OA in the studies conducted by Karadag et al. (2015) and Cheng et al. (2012). The higher mean scores of our study in the second assessment than in the literature may be explained by the addition of lavender essential oil into the ostomy bag and informing the patients about eliminating odor.

In our study, all mean scores of the OA scale subdimensions were higher in the second assessment of the experimental group than in the control group ($p < 0.05$; Table 4). In a study conducted by Karadag et al. (2015) of patient OA, it was determined that the acceptance, anxious/preoccupation, social engagement, and anger subdimensions mean scores were increased in the second assessment. In our study, the subdimension scores obtained from the first and second assessments of the control group were similar to scores in the study conducted by Karadag et al. (2015). It is considered that informing the individuals who has permanent colostomy about odor-preventive measures and using lavender essential oil in the colostomy bag may increase general OA, acceptance of challenges, and social engagement and may decrease anxiety, preoccupation, and anger related to life with a stoma.

4.4. Limitations

There are two limitations to this study. First, it is known that eating habits affect the formation of odor in individuals with colostomy (Cengiz and Bahar, 2017; Hooper, J Gutman, 2017). The results obtained from our study may differ from those obtained from individuals with colostomy living in communities with different dietary habits. Therefore, our results cannot be generalized to all individuals with permanent colostomy. Second, permanent colostomy is often preferred for the treatment of colorectal cancers (Hoon et al., 2013; Ambe et al., 2018). Because of the long treatment period, and the short survival time of permanent colostomy patients, the sample size is limited. We excluded the patients from the study who received chemotherapy during the study period. Thus, we would not include the patients who have to continue adjuvant chemotherapy treatment. Also, nearly one hundred patients could not be contacted due to incorrect phone numbers in hospital records.

4.5. Implications for research and clinical practice

One physiological problem that individuals with ostomy often experience is odor caused by uncontrolled gas and stool output. Individuals undergoing stoma surgery may experience problems affecting their QoL and OA. However, education given to individuals undergoing stoma surgery may increase the individual's QoL and OA

(Celasin et al., 2011; Cheng et al., 2012; Danielsen et al., 2013). Informing individuals with ostomy about odor-preventive measures and using lavender essential oil in colostomy bag, can decrease the proportion of patients who complain of odor as a problem caused by uncontrolled gas and stool output, anxiety, preoccupation, and anger related to life with a stoma, and negative feelings related to work, social function, sexuality, and body image; may increase the QoL, OA, life satisfaction level, and acceptance of challenges. In clinical practice, nurses can educate individuals with colostomy about odor-preventive measures associated with nutrition and using lavender essential oil in colostomy bag.

5. Conclusion

This study found that the experimental group patients who used lavender essential oil in the ostomy bag and informed about odor preventive measures experienced fewer odor problems due to uncontrolled gas and stool output compared with the control group, and their QoL and OA were higher than that of the control group.

In accordance with the results of our study; using lavender essential oil in the ostomy bag can be offered to patients as a cost-effective, easily available method because it increases the QoL and OA of patients with colostomy and reduces odor problems. In future studies, researchers could study with individuals with urostomy or ileostomy. Researchers may try lavender essential oil in colostomy bag on societies with different dietary habits like using more or less spices in foods.

Conflicts of interest

No conflict of interest declared.

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