WILEY _I_ INTERNATIONAL JOURNAL _of_ NURSING PRACTICE

RESEARCH PAPER

Effect of acupressure on pain in Iranian leukemia patients: A randomized controlled trial study

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Funding information
Mazandaran University of Medical Sciences, Grant/Award Number: 360

Abstract

Nonpharmacological methods of pain relief such as acupressure are becoming increasingly popular worldwide. Practitioners often claim that such methods are highly effective and less invasive than analgesic drugs, but available empirical evidence is largely inconclusive.

This study aimed to test the hypothesis that, postacupressure intervention, the amount of pain experienced by sampled leukemia patients, who received acupressure in addition to standard care, will reduce substantially compared to patients who received only routine treatment.

This controlled trial was undertaken with hospitalized leukemia patients between February and June 2015. Our primary sample consisted of 100 participants who were randomly allocated to 2 groups. One (intervention) group underwent 12 acupressure sessions in addition to standard treatment while the control group received no intervention apart from being given the standard treatment for leukemia. The visual analogue scale was used to measure the levels of pain experienced. No significant differences were found between the 2 groups across 12 interventions. However, each group reported significantly different pain level changes before and after each intervention, suggested that the acupressure method was effective in reducing pain in the short term.

Nurses are able to apply this complementary therapy alongside other procedures to manage these patients' pain. It is recommended that further studies be conducted to better understand the specific conditions under which acupressure can provide effective pain relief.

KEYWORDS

acupressure, cancer, Iran, leukemia, nursing, pain

SUMMARY STATEMENT

What is already known about this topic?

- Cancer is often characterized by patients experiencing severe pain.

- There are some different methods for pain reduction of cancer patients.

- Few studies have been conducted on the effectiveness of acupressure on cancer patients' pain.

What this paper adds?

- Acupressure can be an effective nonpharmacological technique in reducing leukemia patients' pain.

- Pain in the experimental group reduced significantly after each session.

The implications of this paper:

- Study findings support continued research in this area.

- Further studies should be conducted on other types of cancer to further our understanding of this method of pain relief.

1 | INTRODUCTION

Cancer is one of the leading causes of death worldwide. One of the most prevalent symptoms reported by cancer patients, especially those

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with advanced stages of the disease, is severe pain (Herr, 2011; Rose et al., 2012).

In providing pain relief, one of the more popular methods involve prescribing analgesics, but these drugs often have considerable side effects on patients, either physical or mental. More specifically, analgesics may cause (1) addiction and dependency, (2) low blood pressure, (3) weak vital functions, and (4) drowsiness, nausea, vomiting, shock, etc. For both public and private health care providers, dealing with these side effects are likely to be costly over the long term. For instance, nurses would have to spend extra time and effort to provide additional care for all affected patients. Moreover, this option may also be too costly for cancer patients that are less well-off financially (Belfer et al., 2014; Ripamonti et al., 2012).

Besides conventional pharmacological methods of pain relief, a number of behavioral techniques have also attracted some academic scrutiny of late (Chao et al., 2009). Popular methods include relaxation methods (Büyükyılmaz & Aştı, 2013), therapeutic touch (Anderson et al., 2015), music therapy (Hauck, Metzner, Rohlffs, Lorenz, & Engel, 2013), acupuncture (Paley, Johnson, Tashani, & Bagnall, 2015), and acupressure. Such pain-relieving techniques are often perceived to be easier, safer and more affordable for cancer patients (Chao et al., 2009; Lau et al., 2016). In fact, anecdotal evidence suggests that many patients would try these seemingly less invasive options before resorting to taking analgesics (Gasperini, de Siqueira, & Costa, 2014). Moreover, unlike pharmacological interventions, the aforementioned alternative options do not cause undesirable side effects (Moore, Keogh, Crombez, & Eccleston, 2013). Even though a few of these behavioral methods have been studied by researchers in the past, our paper focuses specifically on the acupressure method.

Acupressure, a kind of therapy whose origins date back more than 5000 years, is often regarded as an integral component of traditional Chinese medicine. This therapy, similar to the acupuncture method,

focuses on specific points around the body (commonly referred to as acupoints or meridians; Bao et al., 2011). It mainly involves the use of precise finger placements to apply pressure on these specific points. Besides fingers, some practitioners prefer to use their palms, elbows, forearms, or even specialized devices to generate acupressure. This is because, according to practitioners, vital energy (qi) in the body circulates through the meridians and any imbalances in the flow of energy can be rectified by stimulating these specific points. In fact, practitioners often claim that "proper" manipulation of acupoints is highly effective for controlling the symptoms of various diseases (Song et al., 2015) (DeLisa, Gans, & Walsh, 2005; King, 2004). There are approximately 365 known acupoints, and each affects a different part of the human body (Faircloth, 2015).

Past empirical studies on the effectiveness of acupressure in alleviating chronic pain have yielded mixed/inconclusive findings. On the one hand, some studies have documented the effectiveness of acupressure in alleviating menstrual pain (Aghamiri, Vigeh, Latifnezhead, & Nabavi, 2005), migraine (Kermanshahi, Sadrizadeh, & Nafisi, 2010) as well as back pain experienced by patients with spondylarthritis(Mahmodzadeh Ardakani, Akbari Kaji, Abotalabi, Mohamannazhad, & GHaforifard, 2012). Conversely, studies such as Kwekkeboom, Cherwin, Lee, and Wanta (2010) reported that nondrug treatments have no significant effects in pain relief. We argue that further empirical scrutiny is required as, apart from the inconclusive empirical evidence, unsubstantiated claims are often made in the popular press as well as practitioner circles regarding the effectiveness of acupressure in alleviating chronic pain experienced by cancer patients. We hypothesized that, postacupressure intervention, the amount of pain experienced by sampled leukemia patients, who received acupressure in addition to standard care, will reduce substantially compared to patients who received only routine treatment.
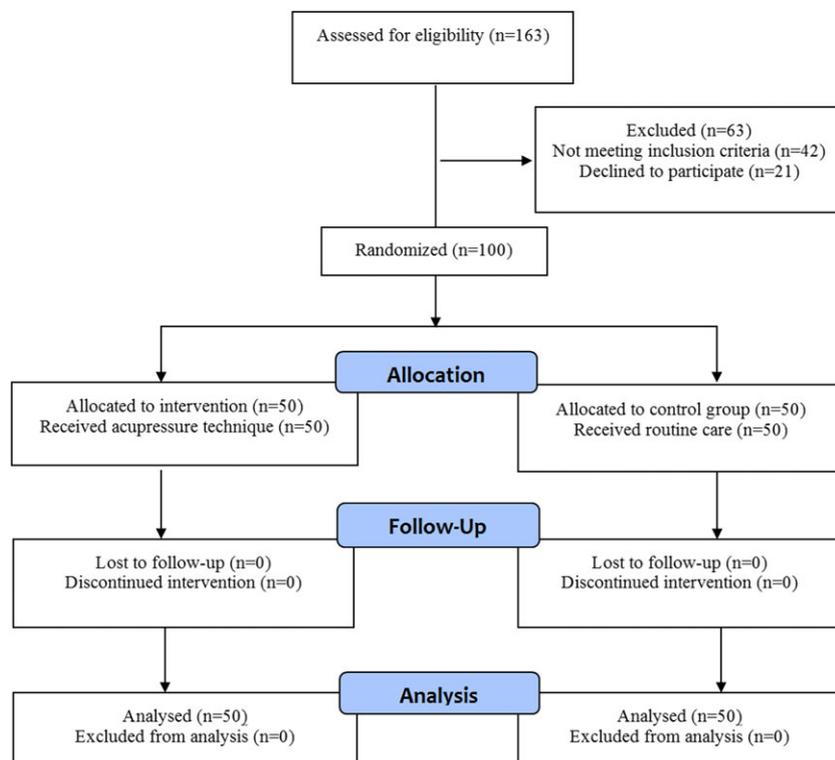

FIGURE 1 Consort diagram showing the number of patients enrolled in the study

2 | METHODS

2.1 | Study design and sample

We adopted a single-blind, randomized control trial research design to investigate the effect of acupressure therapy on the degrees of pain experienced by leukemia patients.

Our primary sample consisted of 163 leukemia patients who were warded at Imam Khomeini Hospital's Oncology Unit (Tehran, Iran) in 2015. In participant selection criteria, all leukemia patients that met the following criteria were invited to participate in this study: (1) age 18 or older; (2) no prior history of heart-related diseases; (3) experienced no abnormal levels of stress before and during the study (based on participant's self-report and his/her doctor's opinion); (4) life expectancy of more than 3 months (based on doctor's diagnosis); (5) normal mental health (based on participant's self-report and his/her doctor's opinion); and (6) receiving opioids for chronic pain caused by cancer.

Some participants were excluded or removed from the study due to the following reasons: (1) transferred to another hospital, (2) having a history of allergy to opioids, (3) having a history of drug abuse, (4) suffering from skin diseases (such as rash and ulcer on acupressure points), and (5) failed to turn up for more than 2 therapy sessions.

The target sample size was set at 100 using the G-power 3.0.10 program taking an impact size of 0.540 (based on a similar study outcome) $\alpha = 0.05$, power $(1-\beta) = 0.80$ at a confidence interval of 95% (Alimi et al., 2003).

2.2 | Measures

Data collection was conducted between February and June 2015. Once a patient's eligibility was determined, we explained the purpose of our study to him/her including the exact nature of the therapy sessions. Those who agreed to participate were asked to sign a consent form. Subsequently, group allocation was performed: a random number table was used to select patients from an initial name list through simple random sampling.

Each participant was then allocated into either the intervention or the control group by block randomization with a random sequence of 2 or 4 block sizes (please refer to Figure 1). In demographic characteristics, the 2 groups were broadly similar with respect to the following dimensions: age, sex, occupation, education, economic status, marital status, duration of disease, type of cancer, family history of cancer, and stage of the disease (see Table 1). All relevant information was collected by our research assistant through face-to-face interview with each participant prior to conducting the intervention sessions.

2.3 | Intervention

Data were collected 15 minutes before, and immediately after, every scheduled therapy session. For example, each participant had to complete a pain intensity scale pre and postintervention. At the beginning of the first intervention session, our acupressure specialist (a member of the Iranian Association of Acupuncture) explained the specific mechanics of this technique to all participants. For the purposes of this study, a number of acupressure points were selected based on past studies and also expert practitioners' opinion (Melzack, Stillwell, &

TABLE 1 Sociodemographic characteristics of patients in the randomized groups

Variables	Experimental Group N (%) or Mean (SD)	Control Group N (%) or Mean (SD)	P value
Sex			
Male	25(50%)	23(46%)	.485
Female	25(50%)	27(54%)	
Age	45.80(6.16)	44.10(6.33)	.177
Marriage			
Single	9(18%)	12(24%)	.461
Married	41(82%)	38(76%)	
Education			
Illiterate	15(30%)	12(24%)	
Diploma	23(46%)	26(52%)	.440
Bachelor	12(24%)	10(20%)	
Master and above	0(0%)	2(2%)	
Economic situation			
Weak	10(20%)	9(18%)	
Average	27(54%)	27(54%)	.956
Good	13(26%)	14(28%)	
Employment			
Employee	22(44%)	16(32%)	
Unemployed	6(12%)	11(22%)	
Student	1(2%)	3(6%)	.328
Self-employment	21(42%)	20(40%)	
Cancer stage			
Stage 1	6(12%)	4(8%)	
Stage 2	18(36%)	18(36%)	
Stage 3A	17(34%)	19(38%)	.972
Stage 3B	6(12%)	6(12%)	
Stage 3C	3(6%)	3(6%)	
Cancer type			
AML	13(26%)	12(24%)	
ALL	22(44%)	20(40%)	.815
CML	15(30%)	18(36%)	
Family history			
Yes	15(30%)	14(28%)	.826
No	35(70%)	36(72%)	

Abbreviations: AML, acute myeloid leukemia; ALL, acute lymphoblastic leukemia; CML, Chronic myeloid leukemia.

Fox, 1977; Richardson & Vincent, 1986). These points included Tai Chong (LIV-3), Zusanli (ST-36), Quchi (LI-11), and Hegu (LI-4). The selected points, LI4 (between the first and second metacarpal bone), LI 11 (midpoint of L5 and the lateral humeral epicondyle), ST-36 (the front of the tibia), and LIV3 (the first metatarsal), were stimulated bilaterally for 2 minutes by the specialist (Yuan, 2003). Pressure was applied to the extent that patients felt tingling and mild pain at those specific points (Wong, Lai, & Tse, 2010). After each intervention, patients were asked to determine the amount of pain experienced.

The acupressure techniques, as described above, were repeated 12 times over a 4-week period (ie 3 sessions per week). Each session lasted approximately 8 minutes (Karimipour, Fayazi, MOWLA, & Latifi, 2012). The required number of treatment sessions was rather

subjective as it was partly based on the acupressure specialist's assessment (according to age, general health, and amount of chronic pain) (DeLisa et al., 2005; King, 2004); however, Golbin (2004) recommended that, for chronic pain, at least 6 sessions of acupressure is required (Golbin, Kravitz, & Keith, 2004). The acupressure specialist for this study was a qualified doctor (ie MD) who was also an expert in complementary medicines; he had completed special workshops in acupuncture (ie Auricular, Intra Muscular Stimulation (IMS) and Trigger Point Therapy) and was also a member of the Iranian Association of Acupuncture.

As for the control group, they only received the usual treatment for leukemia patients in this hospital. This entailed checking vital signs, monitoring to assess possible reactions to treatments, etc. No acupressure intervention was initiated for them. Furthermore, to avoid any potential sources of bias, no information pertaining to alternative methods of pain relief was given to those who made up the control group. They were only briefed on the different ways of reducing pain, and the supposed effects of acupressure after the study was completed.

2.4 | Outcome measures

In this study, clinical and demographic variables, and the visual analog scale (VAS) were used to determine the severity of pain. Acupressure sessions and pain were the independent and dependent variables, respectively.

The primary measurement instrument for the intensity of pain experienced by participants was the 10-point VAS. This is the most widely used pain assessment tool worldwide; we chose this scale for its high reliability and validity. In addition, the VAS is designed to be user friendly—the extreme left (0) indicates no pain, and the right side (10) represents the most severe pain imaginable. After each acupressure intervention session, patients were asked to determine the amount of pain that they felt on the pain-scale ruler. More specifically, they were given less than 1 minute to express the severity of pain experienced by using a number based on VAS. Score of 1-3 indicates mild pain, 4-7 moderate pain, and 8-10 severe pain (de Beer et al., 2012).

2.5 | Ethical considerations

This study was conducted in accordance to the conventions laid out within the Helsinki Statement (Association GAotWM, 2014) and was approved by our associated university's medical sciences ethics committee (Code 362, approved in 2015). Patients were (1) informed about the study's aims and procedures, (2) informed about the voluntary nature of their participation, and (3) given assurances that any/all interventions would not affect their conventional medical care before signing an informed consent document. Patient confidentiality was assured by completing all of the study procedures in a quiet treatment area. All personal data were anonymized by using codes when referring to participants.

2.6 | Statistical analysis

Descriptive statistics included frequencies, mean and standard deviation for sociodemographic variables of the participants. These were analyzed using the Statistical Package for the Social Sciences version 23.0 (SPSS Inc., Chicago, Illinois). A mixed analysis of variance (ANOVA) test was conducted to examine the effect of the acupressure method on participants' pain levels. The mixed between-within subjects ANOVA compared the mean differences in pain between groups split along the following dimensions: (1) before and after intervention and (2) after all 12 interventions (as within subjects), as well as (3) control and experimental group (as between subjects). To improve our understanding of the effectiveness of interventions, we used repeated measures ANOVA and independent paired t-tests. An effect size of 0.5 suggests change that is clinically important (Dworkin et al., 2008). The significance level for all the tests was set at $P < .05$.

3 | RESULTS

Table 1 shows the sociodemographic profiles of study participants. Most were married (ie 41 patients in the experimental group and 38 patients in the control group) with a mean age of 45.80 years for the experimental group and 44.10 years for the control group. Participants

TABLE 2 The results of mixed between-within subjects ANOVA to examine the effectiveness of acupressure on pain

		Sessions					
		1	2	3	4	5	6
Control	Before	7.84 (1.376)	7.80 (1.370)	7.78 (1.404)	7.88 (1.206)	7.72 (1.457)	7.80 (1.370)
	After	7.80 (1.245)	7.78 (1.234)	7.82 (1.335)	7.70 (1.313)	7.78 (1.314)	7.50 (1.298)
	Mean difference	.040 (.989)	.020 (1.134)	−.040 (1.245)	.180 (1.410)	−.060 (1.361)	.300 (1.876)
	P value	.776	.901	.821	.371	.757	.264
Experimental	Before	7.94 (1.406)	8.20 (1.245)	8.06 (1.346)	8.02 (1.421)	7.96 (1.245)	7.98 (1.505)
	After	5.64 (1.258)	5.58 (1.341)	5.52 (1.233)	5.48 (1.359)	5.46 (1.265)	5.54 (1.297)
	Mean difference	2.300 (.839)	2.620 (.923)	2.540 (.930)	2.540 (1.182)	2.500 (.974)	2.440 (1.500)
	P value	<.001	<.001	<.001	<.001	<.001	<.001

Note: Values are Mean (SD); *P* value is adjusted for age and sex

in both groups had similar sociodemographic backgrounds (P values range from .177-.972).

Table 2 reports the mean and standard deviation values of variables for each group before and after each intervention session. A mixed, between-within subjects ANOVA was conducted to examine the effectiveness of acupressure on the intensity of pain experienced by these leukemia patients. We did not find any significant 3-way interaction between (1) group, (2) before/after, and (3) time (across 12 interventions: Wilk Lambda = .860, F (11, 86) = 1.273, P = .254). The effect size, using eta-squared ($\eta2$), was .140, which is rather small. However, the results showed a significant 2-way interaction between (1) group and (2) before/after (Wilk Lambda = .341, F (1, 96) = 185.534, P < .001). This effect size, using eta-squared ($\eta2$) was .659, which is large. This indicates that the groups had significantly different pain level changes from before to after each intervention. More specifically, findings suggest that the acupressure method was effective in reducing the amount of pain experienced by patients after each session.

It is interesting to note the interaction between time (across the 12 interventions) and group was not significant at 95% confidence level (Wilk Lambda = .911, F (11, 86) = .766, P = .672), indicating we failed to find a significant difference in pain experienced for both control and experimental groups over 12 interventions.

Figure 2 shows the interaction between (1) before/after and groups while controlling for 12 interventions (left) and (2) between time across 12 interventions and groups while controlling for before/after (right).

4 | DISCUSSION

Our study was designed to investigate the effect of acupressure on the amount of pain experienced by leukemia patients as these cancer sufferers often suffer prolonged, severe pain. Results show a statistically significant reduction in the amounts of pain experienced by patients in the intervention group as compared to the control group after every therapy session. This is in line with previous empirical findings focused on various diseases. For example, Hjelmstedt, et al. (2010) studied the effect of acupressure on labor pain and reported a significant difference in reducing labor pain. Hsieh, Kuo, Yen, and Chen (2004) investigated the effect of acupressure in 146 patients with chronic low back

pain and concluded that acupressure significantly reduces the amount of pain experienced by patients for up to 6 weeks postintervention.

Over the 12 intervention sessions we conducted, trends of pain change in the intervention group were not significant. Possible reasons include (1) participants were already consuming pain relief medications such as opioids, (2) patients adapted to the acupressure process. Even so, for each of the 12 sessions, differences in amounts of pain experienced pre and postintervention were significant. Hence, we contend that acupressure is beneficial in reducing the amount of pain felt by cancer patients immediately after each session.

One possible explanation for this observation is that acupressure therapy makes patients feel relaxed, which leads to reduction of perceived pain. Alternatively, studies have reported that certain peptides are released when the body is subjected to acupressure manipulations, and that these act as both analgesics and sedatives. More specifically, these peptides influence the body's sympatho-adrenal system in ways that would result in reduction of pain and anxiety (Kotani et al., 2001). This empathic effect of acupressure is well known. Therefore, we postulate that acupressure controls pain through mechanical, physiological, and psychological channels.

4.1 | Limitations

Our acupressure expert's opinion was not to have a placebo group to better eliminate "confounding" factors. He also highlighted the possibility that, if pressure is "incorrectly" applied (ie to spots that are near to the chosen meridian points but not on those exact spots), we may obtain biased or inaccurate results. These are limitations for this study. Although it used a single-blind, randomized design, some of the study subjects were able to discern their treatment, thereby posing a potential bias in the study's primary outcome findings by creating the effect of alleviating pain mentally. Another limitation of the study was that we evaluated only 4 acupressure sites. Although these sites were chosen to relieve pain, it remains possible that pain relief could have resulted from stimulation of other sites. The intervention was delivered 2 hours after receiving analgesic drugs, but some limited effect of these drugs in alleviating pain are almost unavoidable. Furthermore, as this study used only 1 medical institution and 1 experienced acupressure operator, further studies are needed to determine the wider generalizability of our conclusions. Lastly, a myriad of factors can potentially affect the pain perception of patients that we were unable

TABLE 2 (Continued)

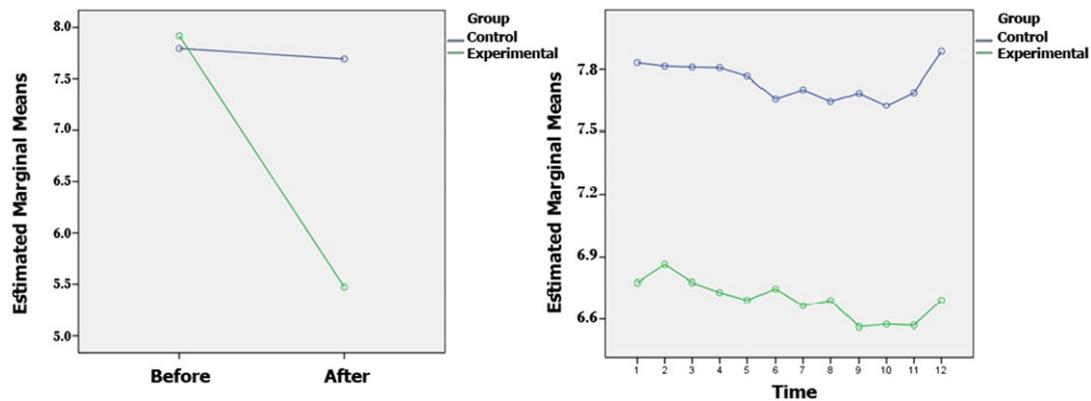|	Sessions						P value
	7	8	9	10	11	12	
Control	7.70 (1.460)	7.88 (1.365)	7.64 (1.638)	7.90 (1.344)	7.64 (1.601)	7.88 (1.288)	.941
	7.70 (1.403)	7.42 (1.472)	7.74 (1.549)	7.36 (1.562)	7.72 (1.666)	7.88 (1.239)	.647
	0.000 (1.773)	.460 (1.940)	−.100 (1.951)	.540 (1.908)	−.080 (2.184)	0.000 (1.616)	
	1.000	.100	.719	.051	.797	1.000	
Experimental	7.94 (1.406)	8.00 (1.616)	7.78 (1.516)	7.82 (1.535)	7.84 (1.434)	7.58 (1.486)	.328
	5.40 (1.443)	5.38 (1.292)	5.34 (1.493)	5.32 (1.406)	5.32 (1.596)	5.82 (1.380)	.380
	2.540 (1.249)	2.620 (1.563)	2.440 (1.514)	2.500 (1.502)	2.520 (1.717)	1.760 (1.661)	
	<.001	<.001	<.001	<.001	<.001	<.001	

FIGURE 2 Plot of the mean scores of pain in control and experimental group pretest/posttest (left) and time (right)

to control in the present study eg cultural, social, and emotional factors. These factors should be considered in future studies.

5 | CONCLUSION

This paper has identified and evaluated the effectiveness of acupressure on pain reduction among cancer patients. Based on the results obtained from the present study, it can be stated that acupressure methods applied to recommended points along with the other medical treatments can have pain alleviating effects without any side effects. In administering acupressure therapy to patients, nurses should be properly trained to enable them to apply this complementary therapy along with other medical procedures. Finally, it would be interesting to undertake comparative cultural studies in the control and effectiveness of this method for pain relief in cancer patients.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

AUTHORSHIP STATEMENT

All authors meet the authorship criteria and that they all agree with the content of the manuscript.

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