



Original Article

Effects of Aroma Inhalation on Fatigue and Sleep Quality of Postpartum Mothers

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Abstract

Purpose: The purpose of this study was to measure the effects of aroma inhalation on fatigue and quality of sleep of postpartum mothers. **Method:** The study design was a non-equivalent control group pre-post design. 51 Postpartum mothers were assigned either to a control group or to an experimental group that was exposed to aromas through inhalation for 6 days. Subjects in the experimental group were instructed to wear a necklace filled with Lavender and Eucalyptus oil from 2:00 PM to 8:00 PM every day. Fatigue was measured using the Rhoten Fatigue Scale. Sleep duration, night arousal frequency and sleep satisfaction were used to assess the quality of sleep. **Result:** There was a significant difference in the score of fatigue following the treatment between the experimental and control groups ($t=-2.79$ $p=.00$). However, there was no significant difference in sleep duration, frequency of night arousal and sleep satisfaction following aroma inhalation between two groups. **Conclusion:** This intervention appears to be effective in reducing the fatigue in postpartum mothers.

Key words : Aroma Inhalation, Fatigue, Sleep quality, Postpartum mothers

INTRODUCTION

1. Significance

As an adaptive reaction following childbirth, postpartum fatigue must be distinguished from tiredness, and results from a very complicated interaction among physical, emotional, environmental and physiological factors (Atkinson & Baxley, 1994).

In general, it has been shown that postpartum fatigue begins immediately after childbirth and becomes more severe over time, so that within 36 hours of childbirth, postpartum mothers consider fatigue to be a problem which continues to become more serious through the first 6 weeks (Milligan, Parks, & Lenz, 1990). According to Gardner (1991), the level of fatigue perceived by women who had normal vaginal childbirth was higher during the second day than during the second and sixth weeks after childbirth. Milligan, Lenz, Parks, Pugh and Kitzman (1996) also reported that the level of fatigue was higher from the period immediately following childbirth to the sixth week than the 3-month period following childbirth and, therefore, that it would be very important to properly control fatigue during the initial period following childbirth, including the period of hospitalization after childbirth.

It has been reported that postpartum fatigue is related to

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stress in the process of metabolism and water shift, sudden changes in the endocrine system, and sleep disturbances during the third week of pregnancy, which is also influenced by pain and exhaustion during labor and delivery. In addition, there are physiological factors that affect fatigue, including episiotomy, changes in sleep cycles, adaptation to breast feeding, and sudden hormone mobility. Environmental factors also affect fatigue, including social and economic status, employment, exercise and sleep (Pugh & Milligan, 1995).

Although it has been proven that there is a correlation between fatigue and sleep (Walker, 1999), no consistent finding has been reported with regard to cause and effect relationship. While Lee and DeJoseph (1992) insisted that lack of sleep causes fatigue and postpartum depression, Fuller and Schaller-Ayers (2000) reported that if people do not get a proper amount of sleep, a loss of energy and vitality will occur, in addition to mental fatigue. For this reason, further studies have to be carried out on the relationship between fatigue and sleep. It is also true that much concern has been expressed about fatigue and sleep of postpartum mothers during the period of childbed, and it seems that an inappropriate level of fatigue and sleep leads to the cessation of breast feeding, leading to problems such as disturbed maternal - infant attachment (Bourgoin et al., 1997).

The number of problems postpartum mothers have with sleep disturbance has increased gradually. It has been shown that while some considered the problem a result of excessive physical exercise, others thought that their fatigue led to sleep disturbance (Lee & DeJoseph, 1992). The level of sleep disturbance measured during the 1-month period following childbirth was higher than that measured during the third trimester of pregnancy (Warter & Lee, 1996).

While taking care of postpartum mothers after childbirth, nurses are in the best position to carefully observe and evaluate their levels of fatigue and sleep disturbance (Gardner, 1991). However, the period of hospitalization following childbirth is too short for nurses to properly monitor and control postpartum fatigue and sleep disturbance. Postpartum mothers, therefore, should directly learn how to solve their problems with fatigue and sleep disturbance, with the assistance of nurses.

Thus, aromatherapy has emerged as an alternative nursing intervention and has recently attracted much interest. Since the most widely used methods of aromatherapy requires the service

of massage therapists, many studies have been carried out looking into aroma inhalation as an alternative therapy. This method consists of the inhalation of essential oils through the nose and mouth, effectively stabilizing feelings and concentration. Furthermore, the inhalation also relieves pain through sedation. The molecules of aroma oil inhaled through the nose and mouth are immediately drawn into the lungs and impact individual tissues and organs. Recently, certain types of necklaces containing aroma oil designed for aroma inhalation have become available on the market; these necklaces make it possible for the aroma oil to slowly spread through the air and be inhaled.

Some studies on the effect of aroma inhalation on postpartum mothers have been conducted. For example, Lee (2000) reported that when a 20-minute back massage with aroma oil was performed on 20 mothers between the first and third weeks postpartum, levels of postpartum fatigue were significantly reduced. In addition, Kim (2003) reported that when an analysis was done on postpartum mothers' experience responses expressing their subjective feelings after a 30-minute aroma therapy, including aroma inhalation, aroma bathing and aroma massage, had been provided to 10 postpartum mothers every day for 30 minutes, there was reduction in their level of depression, postpartum fatigue and pain of wrists and fingers, as well as feeling better.

Accordingly, it seems that this method of aroma inhalation conducted, through necklaces filled with aroma oil, is so conveniently applicable and without any adverse side effects, that it can be considered as an alternative nursing intervention useful for the reduction and improvement of fatigue in postpartum mothers.

With early postpartum mothers complaining of fatigue and sleep disturbance, therefore, this study was conducted to examine the effects of inhalation with aroma oil and suggest an effective postpartum nursing intervention.

2. Purpose

The purpose of this study was to test the effects of aroma inhalation on fatigue and sleep quality of postpartum mothers, and its definite aims were:

- To test the effect of aroma inhalation on fatigue levels of early postpartum mothers, and
- To test the effect of aroma inhalation on the sleep quality

of early postpartum mothers.

3. Hypotheses

- Following the treatment, there would be a difference in levels of fatigue between the experimental group and control group.
- Following the treatment, there would be a difference in sleep quality between the experimental group and the control group.
 - Following the treatment, there would be a difference in sleep duration between the experimental group and the control group.
 - Following the treatment, there would be a difference in the frequency of night arousal between the experimental group and the control group.
 - Following the treatment, there would be a difference in sleep satisfaction between the experimental group and the control group.

4. Definition of terms

- Aroma inhalation : It means that postpartum mothers were each asked to wear a necklace with 1cc of lavender and eucalyptus oil (10 drops of lavender and 10 drops of eucalyptus) everyday from 2:00 PM to 8:00 PM, between the first postpartum day and the fifth postpartum day after being discharged from the hospital.
- Postpartum mothers : It implied postpartum mothers within 6 days after childbirth.
- Fatigue : It meant the score measured using Rhoten Fatigue

Scale (Rhoten, 1982).

- Sleep quality : It implied sleep duration, frequency of night arousal, and sleep satisfaction.

METHODS

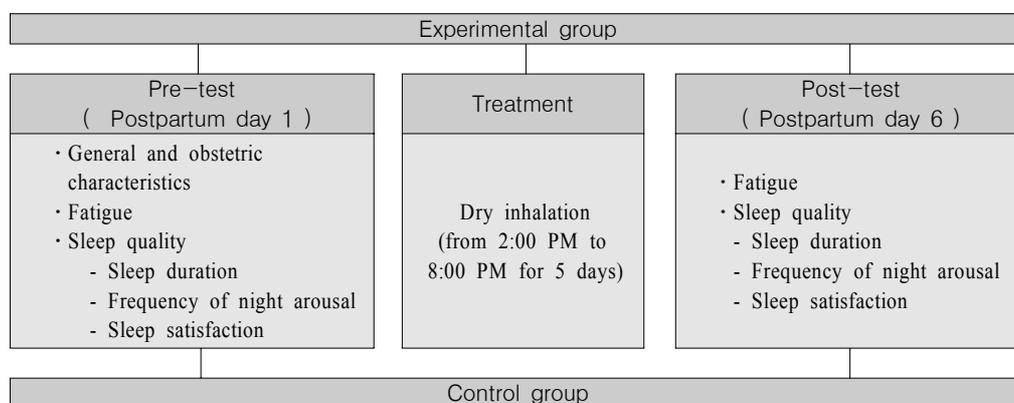
1. Research design

This study used a non-equivalent control group pre-post design. General characteristics, obstetrical characteristics, fatigue level, and sleep quality were measured on the first postpartum day before treatment with the experimental and control groups. Fatigue level and sleep quality were again measured on the sixth postpartum day after 5 days of treatment <Fig. 1>.

2. Subjects

The present study was carried out with 51 mothers who delivered in K Hospital located in K City from April 1 to July 19, 2004. Of course, they agreed to participate in the study, in compliance with the following standards for selection:

- Postpartum mothers who had no prenatal complications or dystocia, with normal vaginal delivery
- Postpartum mothers who delivered a single, cephalic presentation child with normal weight.
- Postpartum mothers who had no complications in childbirth.
- Postpartum mothers who understood and agreed to participate in the study.
- Postpartum mothers who breastfed their infants in a mother-infant room, according to the instructions of the experimental hospital. 25 of the 51 subjects were assigned



<Figure 1> Research design

to the experimental group, and 26 to the control group.

3. Data collection procedure

After both the president and chief nursing officer of K Hospital agreed to cooperate with this study, 30 subjects selected from postpartum mothers who delivered from April 1 to May 2, 2004 were assigned to the control group, and 30 subjects who delivered from May 16 to July 19, 2004 were assigned to the experimental group. General characteristics, obstetrical characteristics, fatigue level, and sleep quality were measured with questionnaires on the first postpartum day as the pre-test. After the experimental group was exposed to aroma inhalation from the first to fifth postpartum day, the post-test was completed by measuring fatigue level and sleep quality on the sixth postpartum day, in the same manner as that of the pre-test. To make the study convenient, the post test was done at the time when the postpartum mothers visited the hospital for the purpose of medical examination after childbirth. Whether the postpartum mothers were properly in compliance with the requirements for aroma inhalation was ascertained by phone. Although 60 subjects originally took part in the study, subjects who did not participated in the post test were excluded, so that eventually 51 subjects participated in this study, consisting of 26 in the control group and 25 in the experimental group.

4. Aroma inhalation

Lavender and eucalyptus oil proven to be safe were used as aroma oil for inhalation, which have been known to be very effective in controlling the pain of labor and delivery, and feeling better, while being preferred by the postpartum mothers (Burns & Blamey, 1994). According to the study carried out by Burns & Blamey (1994), clarysage and peppermint also help to relieve nausea and vomiting, and are also favored by postpartum mothers. Nevertheless, those oils were not used in this study because they have been known to cause a reduction in breast milk production and unbalanced female hormone levels (Ha, 2000).

Postpartum mothers were asked to wear a necklace with 1cc of lavender and eucalyptus oil (10 drops of lavender and 10 drops of eucalyptus) everyday from 2:00 PM to 8:00 PM between the first postpartum day and the fifth postpartum day after being discharged from hospital. Aroma oil remained until the sixth postpartum day. The reason why the treatment was performed for 5 days was because there was a reduction in the level of depression and a subjective improvement in sleep when Lee, Park, & Ryu (2002) asked middle-aged women to inhale lavender essential oil for 1 week. The reason why they were asked to wear the necklace everyday from 2:00 PM to 8:00 PM was because it had been revealed in a study (Troy, Dalgas-pelish, 1997) that postpartum mothers complained of

<Table 1> Homogeneity test of general characteristics between between two groups (N=51)

Variables		Experimental	Control	χ^2 / t value	p
		(n=25) n(%) / M \pm SD	(n=26) n(%) / M \pm SD		
Education	High school	6(24)	6(23)	.04	.98
	College	8(32)	9(39)		
	University	11(44)	11(38)		
Employment	Employed	7(28)	10(38)	2.5	.62
	Unemployed	18(72)	16(62)		
Monthly income (Thousand won)	<2,000	10(40)	14(53)	1.18	.56
	2,000~2,999	5(20)	5(19)		
	\geq 3,000	10(40)	7(28)		
Gender of the newborn infant	Male	20(80)	17(65)	.73	.39
	Female	5(20)	9(35)		
Parity	Primipara	10(40)	13(50)	.19	.38
	Multipara	15(60)	13(50)		
Age(yr)		31.0 \pm 3.23	30.8 \pm 3.26	.17	.39
Gestational period(wk)		39.4 \pm 1.08	39.5 \pm 1.01	-.29	.87
Hemoglobin(g/dl)		11.6 \pm 1.08	11.3 \pm 1.07	.94	.35
Delivery duration(hrs)		4.59 \pm 2.97	4.59 \pm 2.69	-.01	.99

more fatigue in the afternoon than in the morning during the 6-week postpartum period. Also, the reason for asking them to stop wearing necklace after 8:00 PM was because they were so busy with baby bathing, sitz-bath and breast feeding and, therefore, felt inconvenient with wearing necklace. Whether they had worn the necklace properly was ascertained by asking them to prepare a daily report, and by checking them when they came in to have medical examinations on the sixth postpartum day. If the subjects had not worn the necklace for any reason, they were removed from the present study.

5. Instruments

1) Fatigue

The level of fatigue was measured using the Rhoten Fatigue Scale (Rhoten, 1982), ranging from 0, "Full of vitality without any fatigue," and 10, "Utterly tired," based on a 10 cm-long line. Using this scale to measure fatigue as a single concept, Rhoten (1982) reported that it had a correlation with general appearance, communication activity, and the attitude concerning fatigue. Also, the scale was used by Song (1992) to measure chemotherapy patients' levels of fatigue, and by Gardner (1991), to measure postpartum fatigue. In this study, its

test-retest reliability was $r=.48(p=.00)$ so that its stability was ensured.

2) Sleep quality

Sleep duration, frequency of night arousal, and subjective sleep satisfaction were measured using a self-developed instrument to measure such sleep quality. Sleep duration was measured in their ways as asking the subjects to record the total duration of nighttime sleep plus daytime sleep at pre and post test, and was calculated by the hour. Frequency of night arousal was measured by asking them to record their frequency of previous night arousal everyday during the experimental period, and using the mean value of total arousal frequency for five days as the value measured for the post-test, based on the unit of frequency. Sleep satisfaction was measured with Vertical Visual Analogue scale, developed by Synder-Halpern and Verran (1987) and redesigned exclusively for this study, where 0 on the left end indicates "Not satisfied at all" and 10 on right end means "Fully satisfied," on the basis of a 10 cm-long line. Its test-retest reliability was $r=.30(p=.03)$ so that its stability was ensured.

6. Data analysis

<Table 2> Homogeneity test of dependent variables between two groups

(N=51)

Variables	Experimental	Control	t	p
	(n=25) M ± SD	(n=26) M ± SD		
Fatigue	5.48 ± 1.61	5.34 ± 1.39	1.91	.85
Sleep duration	7.72 ± 2.13	7.69 ± 2.09	.05	.96
frequency of night arousal	3.36 ± 1.26	3.19 ± 1.59	.20	.84
Sleep satisfaction	4.40 ± 1.70	4.46 ± 1.85	-.12	.90

<Table 3> Effect of aroma inhalation on fatigue of postpartum mothers between two groups

(N=51)

Variable	Group	Pre-test	Post-test	t	p
		M ± SD	M ± SD		
Fatigue(score)	Experimental	5.48 ± 1.61	4.08 ± 1.77	-2.79	.00
	Control	5.34 ± 1.39	5.46 ± 1.74		

<Table 4> Effects of aroma inhalation on sleep quality of postpartum mothers between two groups

(N=51)

Variable	Group	Pre-test	Post-test	t	p
		M ± SD	M ± SD		
Sleep duration(hrs)	Experimental	7.72 ± 2.13	8.12 ± 1.64	.54	.59
	Control	7.69 ± 2.09	8.06 ± 1.49		
Frequency of night arousal (times)	Experimental	3.36 ± 1.26	1.28 ± .79	-.80	.42
	Control	3.19 ± 1.59	1.46 ± .81		
Sleep satisfaction(score)	Experimental	4.40 ± 1.70	6.64 ± 1.35	1.30	.19
	Control	4.46 ± 1.85	6.15 ± 1.31		

Collected data were analyzed with SPSS WIN 11.0. General and obstetrical characteristics of subjects were analyzed using frequency and mean. Homogeneity analysis on general and obstetrical characteristics between the two groups was done with both the χ^2 test and t-test, and dependent variable homogeneity with the t-test. The hypotheses were tested using the t-test pairs.

RESULTS

1. Homogeneity test of general and obstetrical characteristics

The results of the homogeneity test of general and obstetrical characteristics are shown in Table 1. Regarding the educational level of subjects, college graduation was 11 persons each in both the experimental and control groups, respectively. The number of jobless subjects was 18 persons in the experimental group and 16 persons in the control group. The incomes of 10 subjects in the experimental group and of 14 subjects in the control group amounted to more than 1 million Korean Won and less than 2 million Korean Won. 10 subjects in the experimental group and 16 in the control group had incomes amounting to more than 3 million Korean Won. Regarding the gender of newborn infants, 20 babies in the experimental group and 17 in the control group were male. The number of primipara was 15 persons in the experimental group and 13 in the control group, and the number of multipara was 10 persons in the experimental group and 13 persons in the control group. Eventually, it was shown that both groups were homogeneous. The mean age of subjects was 31 years old in the experimental group and 30.8 years old in the control group, and was thus also homogeneous. The gestational period was 39.4 weeks in the experimental group and 39.5 weeks in the control group, equating to no difference. The level of hemoglobin was 11.6 g/dl in the experimental group and 11.3 g/dl in the control group and was thus homogeneous. Delivery duration was 4 hours and 59 minutes in both the experimental and control groups.

2. Homogeneity test of dependent variables

Homogeneity of dependent variables was analyzed with the pre-test before treatment, as shown in Table 2. The level of

fatigue was 5.48 points in the experimental group and 5.34 points in the control group and was thus homogeneous. Additionally, the mean sleep duration was 7.72 hours in the experimental group and 7.69 hours in the control group, and the mean frequency of night arousal was 3.36 times in the experimental group and 3.19 times in the control group, equating to no significant difference. The mean score of sleep satisfaction was 4.4 and 4.46 points in the experimental and control groups, respectively, also equating to no significant difference.

3. Hypotheses test

- Hypothesis 1 : Results analysed on the hypothesis that "There was a difference in the level of fatigue following the treatment between the experimental and control groups." are shown in Table 3. It was shown on the post-test that the level of fatigue was 4.08 points in the experimental group and 5.46 in the control group, thus showing significant difference ($p=.00$). For this reason, Hypothesis 1 was supported.
- Hypothesis 2 : "There was a difference in sleep quality following the treatment between the experimental and control groups."
 - Hypothesis 2-1 : Results analysed on the hypothesis that "There was a difference in sleep duration following the treatment between the experimental and control groups." are shown in Table 3. It was shown on the post-test that sleep duration was 8.12 and 8.06 hours in the experimental and control groups, respectively, thus showing no significant difference. For this reason, Hypothesis 2-1 was rejected.
 - Hypothesis 2-2 : Results analysed on the hypothesis that "There was a difference in the frequency of night arousal after the treatment between the experimental and control groups." are shown in Table 3. It was shown on the post-test that the frequency of night arousal was 1.28 times in the experimental group and 1.46 times in the control group, thus showing no significant difference. For this reason, Hypothesis 2-2 was rejected.
 - Hypothesis 2-3 : Results analysed on the hypothesis that "There was a difference in sleep satisfaction following the treatment between the experimental and control groups." are shown in Table 3. It was shown on the post-test that sleep satisfaction was 6.64 and 6.15 points

in the experimental and control groups, respectively, thus showing no significant difference. For this reason, Hypothesis 2-3 was rejected.

DISCUSSION

So far, studies have not been actively carried out on fatigue and sleep quality of postpartum mothers, and, clinically, the mothers with normal vaginal delivery were hospitalized so shortly that they could not be included in nursing care. It has been known that postpartum mothers' fatigue and lack of sleep, however, cause them to stop breastfeeding for the first postpartum month (Bourgoin et al., 1997) and have negative effect on the development of mother-infant interaction (Gardner & Campell, 1991). It is desirable for the nurse, therefore, to provide postpartum mothers with nursing intervention to solve those problems, and to educate the mothers to optimize their self-care, since their postpartum fatigue and sleep disturbance can continue to be significant problem during the period of childbearing (Troy & Dalgas-Pelish, 1997).

In this study, fatigue of the postpartum mothers was 5.48 points on the first postpartum day in the experimental group, and 5.34 points in the control group. Those levels were higher than 4.47 points in cancer patients with chemotherapy (So et al., 2004), and 4.6 points in postpartum mothers with normal vaginal delivery when measured on the second postpartum day (Gardner, 1991). Gardner (1991) has reported that the level of fatigue on the second postpartum day is related to breast-feeding, and Milligan et. al. (1996) insisted that the breast-feeding of postpartum mothers increases their levels of fatigue. It could be considered, therefore, that in this study, since all of the subjects did breast-feeding, their levels of fatigue were higher than those other groups.

Similarly, there have been other studies which reported the reduction in postpartum mothers' fatigue level, for example, such as Lee's report (2000) that when a 20-minute back massage with aroma oil was performed on 20 mothers between the first and third weeks postpartum, the level of their postpartum fatigue was reduced significantly. Also, Lee (2002) reported that there was a reduction in the level of fatigue when aroma inhalation, in addition to the back massage with aroma oil, was provided to 27 middle-aged women.

The present study was performed to test the effects of aroma inhalation on their sleep quality and fatigue level of

postpartum mothers for the first 5-day period. Results showed that there were no significant effect of aroma inhalation on the sleep quality in terms of sleep duration, frequency of night arousal, and sleep satisfaction. The reason seemed to be that in the pre test, the mean sleep duration of the experimental and control groups was 7.72 and 7.69 hours, respectively, similar to an adult's mean sleep duration, so postpartum mothers seem to have enough sleep. There was also no difference in the change of postpartum mothers' frequency of night arousal. The major reason for their night arousal was "to breastfeed." The postpartum mothers' sleep satisfaction was 4.4 points on the pre-test and 6.64 points on the post-test in the experimental group, and 4.46 points on the pre-test and 6.15 points on the post-test in the control group. The fact that both of the two groups showed a "Good" level of sleep satisfaction implied that they had no particular sleep disturbance. Another reason is inadequate time to evaluate the experimental effectiveness. Total sleep duration on the post-test was measured once on the fifth postpartum day, and sleep satisfaction was also measured once on the sixth postpartum day. The frequencies of night arousal recorded by the postpartum mothers for the 5-day treatment period were divided by the mean value and used as a measuring value on the post-test. Because its experimental effectiveness was measured once on the post-test, it was not possible to know how effective aroma oil inhalation was during the treatment. Similarly, a study was carried out by asking elderly people in institutional settings to inhale lavender aroma for 4 weeks. It was reported on the pre-test and post-test that there was no significant difference in total sleep duration and frequency of arousal while sleeping (Lee, Park, Kim, & Kim, 2002). In this study, on the other hand, the treatment was performed only by asking the elderly subjects to wear an aroma necklace from 2:00 PM to 8:00 PM. Cannard (1995) reported that when individual pillows were soaked with a few drops of oil mixed with lavender, basil, juniper and sweetmasoram, and a hand massage was performed just before sleeping, sleep disturbance was improved and sleeping drug use was significantly reduced. Based on the study result that when individual pillow of 15 old people in institutional center were soaked with a few drops of lavender oil, there was the improvement of their night sleep quality and daytime mental alertness (Hudson, 1995), also, it has been apparent that aroma inhalation just before sleep was important and that adding active nursing

interventions to aroma inhalation and massage was more effective. In addition, this study had some limits due to the fact that it was forced to comply with the breast-feeding policy of the experimental hospital, and due to the moral problem of prohibiting the subjects from breast-feeding. Moreover, it was also impossible to control the frequency of their night arousal to breastfeed during the treatment, as well as the frequency of infants awakening and crying at night. It is necessary, in the future, therefore, to measure the sleep quality of the postpartum mothers, using the aromatherapy which includes aroma inhalation just before sleep with a times series design.

Although it has been revealed in this study that aroma inhalation is effective in reducing fatigue of postpartum mothers, it has the following limits. First of all, it was impossible to clearly measure each effect of aroma inhalation on the physical, mental and nervous level of fatigue because the single test question item Visual Analogue Scale was used to measure fatigue of postpartum mothers, in order to minimize their burden in completing the questionnaire. Second, the postpartum mothers breastfed so that their frequency of night arousal to breastfeed could not be controlled. Third, the level of depression was not measured, and depression has been known to have an effect on postpartum fatigue and sleep disturbance.

It seems, therefore, that further studies have to be carried out after addressing those limits and that postpartum mothers' self control programs, including aroma inhalation, have to be developed and performed to prevent postpartum fatigue and sleep disturbance.

CONCLUSION

This study was conducted to test the effects of aroma inhalation on fatigue and sleep quality of postpartum mothers. The study used a non-equivalent control group pre post design. Data was collected from 51 postpartum women with normal vaginal deliveries in K Hospital located in K City from April 1 to July 19, 2004.

It was shown that the change of sleep quality was not statistically significant between the experimental group, which underwent aroma inhalation, and the control group. Again, there was no significant difference in sleep duration, frequency of night arousal, and sleep satisfaction following aroma

inhalation between the two groups. However, there was a significant difference in the score of fatigue following the treatment between the experimental and control groups ($t=-2.79$ $p=.00$).

In conclusion, aroma inhalation can be a nursing intervention which is effective in reducing the fatigue of postpartum mothers. Based on the above results of this study, some suggestions are recommended for further study.

- Need to use aroma inhalation as a nursing intervention to reduce the fatigue of postpartum mothers.
- Need to test the effects of aroma inhalation on the level of depression of postpartum mothers and to determine if there is a change in fatigue and sleep quality.
- Need to develop and use an full range of self-care programs available to control fatigue and sleep disturbance of postpartum mothers.
- Need to measure the effectiveness of aroma inhalation including other aroma therapies through a time series design.

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