

Effect of Lavender Cream with or without Foot-bath on Anxiety, Stress and Depression in Pregnancy: a Randomized Placebo-Controlled Trial

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ABSTRACT

Introduction: Psychological disorders are associated with maternal and neonatal morbidities. We aimed to evaluate the effect of Lavender cream with or without foot-bath on depression, anxiety and stress of pregnant women.

Methods: In this trial, 141 women at 25 to 28 weeks gestation were randomly assigned into three groups (47 at each group); receiving Lavender cream with foot-bath, only Lavender cream, or placebo, 2g every night for two months. Depression, anxiety and stress were assessed at baseline, and 4th and 8th weeks after intervention, using DASS-21. General linear model was used to compare the groups.

Results: There were three losses to follow-up at the 4th and one more at the 8th week. Scores of all three outcomes in both Lavender and foot-bath and only Lavender groups were significantly lower than those in the placebo group at the 8th week; adjusted difference of depression score -3.3, 95% confidence interval -4.6 to -1.9; -2.4, -3.7 to -1.0, respectively, anxiety score -1.4, -2.6 to -0.2; -1.7, -2.9 to -0.5 and stress score -3.1, -4.7 to -1.5; -2.7, -4.3 to -1.1. At the 4th week, only score of anxiety in the lavender group (-2.3, -3.9 to -0.8) and stress in the both groups (-2.3, -4.1 to -0.5; -1.9, -3.7 to -0.1) were significantly less than those in the placebo group. There were not statistically significant differences between the two experimental groups in terms of the outcomes.

Conclusion: Lavender cream with foot-bath or alone can be used for pregnant women for reducing their stress, anxiety and depression

Introduction

Occurrence and worsening of psychological symptoms are common in pregnancy and can lead to woman disability to accept pregnancy and childbirth changes. The symptoms may also influence negatively on the nutritional pattern, and maternal and fetal care.¹ Studies show that anxiety and stress in pregnancy can result in fetal growth retardation and preterm delivery² and have constant negative effects on the child mental growth.³ In addition, some other negative effects have been reported; like significant associations

between antenatal depression and anxiety and increased nausea and vomiting, prolonged sick leave, increased number of visits to the doctor, fear of childbirth and planned cesarean delivery,⁴ preeclampsia, and preterm delivery.⁵

Interventions to prevent and treat psychological problems in pregnancy can also have an effect on preventing postpartum psychological problems.⁶ Nowadays, treatment of psychological problems concentrates on the psychotherapy and pharmacotherapy, which their effects can usually occur in long-term. In addition, the

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medicines simply pass from placenta and can have negative effects on fetal and child health.³

Lavender, known scientifically as *Lavandula angustifolia*, is a herbaceous plant from Lamiaceae family and belongs to Mediterranean region.⁷ It is harmless with no reported adverse events in non-pregnant women.^{3,8} Its use is not advised during the first trimester of pregnancy due to its possible association with abortion by an unknown mechanism.³ However, it is safe in the second and third trimester, and may decrease pain and edema, increase organ perfusion and relaxation and result in a pleasant feeling in the mother.^{9,10}

There are some studies showing positive effect of Lavender in decreasing depression level in depressed patients;^{11,12} decreasing anxiety level in patients suffering from cancer,¹³ before surgery,¹⁴ in dental procedures,¹⁵ and reducing stress resulted from intra-uterine device insertion.¹⁶ In addition, it has been shown that Lavender has an anti-stress effect on infants¹⁷ and also on volunteer healthy persons in the form of decreasing pain and stress resulted from an injection.¹⁸

Foot-bath is often considered as a nursing intervention in several countries. Some studies show the positive effect of foot-bath on improvement of autonomic function,¹⁹ sleep quality and relaxation.²⁰

However, systematic reviews indicate that studies about the effect of Lavender and foot-bath on anxiety, depression and stress are insufficient^{8,21} and we found no studies in this area on pregnant women by searching available data bases. Therefore, the objective of this study was to determine the effect of Lavender cream and foot-bath on anxiety, stress and depression in pregnant women.

Materials and methods

This double-blind placebo-controlled trial was conducted on 141 pregnant women aged

18 to 40 years with parity one to three at 25 to 28 weeks gestation.

Exclusion criteria were: being illiterate who were not able to fill out the self-administered questionnaires; history of any chronic diseases due to possible effect of the interventions on them; taking any medication regularly (e.g. sedatives) that might interfere with the interventions; smoking; history of infertility; unwanted recent pregnancy; history of allergy to herbal medicines; having any sign of inflammation on site of cream rubbing; current severe depression, anxiety or stress (score of ≥ 10 in anxiety sub-scale, ≥ 17 in stress sub-scale or ≥ 14 in depression sub-scale, in DASS-21); being obese (BMI ≥ 30) that may increase risk of developing obstructive sleep apnea, sleep disturbances and psychiatric disorders; working at night shift; residence at the outside of Tabriz city; having no access to a phone line (for follow-up); or unwillingness to return for follow-up visits.

After receiving approval from the ethics committee of the research deputy of Tabriz University of Medical Sciences (code: 91184) and registration of study in IRCT (IRCT201211293706N17), subjects were selected using client medical records at 28 out of 83 selected health centers in the city, where there was the largest number of admitted pregnant women. The women were called and potentially eligible ones were invited to the health centers to participate in the study. At this visit, after obtaining written informed consent, the participants filled out the questionnaires and after checking the completed questionnaires in terms of sleep quality, stress, anxiety and depression, eligible subjects were selected and randomly assigned into the groups.

Allocation sequence was determined by block randomization with block sizes of 3, 6 and 9 and allocation ratio of 1:1:1 using a computer-generated randomization schedule, stratified by parity (two strata: first, and second or third).

Sequentially numbered, opaque, sealed envelopes containing two 60g tubes of Lavender or placebo creams with no labels on them were used to conceal the allocation and to maintain blinding. A small identification sheet was placed in the envelopes belong to Lavender cream and foot-bath group. For each participant, four tubes of 60g cream (two per month) were given at two stages, the first and fourth week visits.

The allocation sequence and packages were prepared by a person not involved in the recruitment, data collection and analysis. Therefore, the data collectors and participants were unaware of the type of cream given to every participant. To prevent possibility of the loss of blinding due to the different smell of Lavender and placebo cream, it was only explained to the participants that the effect of an herbal cream is investigated, without mentioning the name of the plant. Although Lavender and foot-bath group were blinded about the kind of cream used, complete blinding was not possible in this group.

All participants were instructed verbally and by written on how to apply the cream, i.e. to rub 2g cream topical on their legs about 1.5 hours before bedtime for 8 weeks and to stop using it after 8 weeks due to possibility of delay in delivery and not to take any other medications outside the trial. To ensure the insensitivity to the cream, the participants were instructed to rub a small amount of cream on one of her leg before its regular application. They were also advised to discontinue applying the cream, notify immediately the investigator if they feel any severe adverse event.

In addition, an identical pack including a towel, a thermometer and a basin were given to every participant in the Lavender and foot-bath group. Also they were instructed on method of footbath, i.e. to soak their feet in 40 - 42 °C tap water, depth of 5cm above the ankle, 30 minutes after applying the cream for 10-20 minutes. They were emphasized to

use the cream and foot-bath regularly, but to use one of them if they could not use both for any reason.

Anxiety, Stress and depression were assessed using DASS-21, a self-administered questionnaire, at three time points; baseline, and 4th and 8th weeks after the intervention; during their visits at the health centers. The questionnaire, a short-form version of the DASS-42, contains seven questions regarding each of the three subscales (anxiety, stress and depression). Respondents were asked to score each statement on a four-points scale, from 0 indicating "does not apply at all" to 3 indicating "apply very much/ almost all of the time". Sum of scores ranged from 0 to 21 were calculated for each subscale. The higher score, the worse condition.²² It has been validated in Iran and reported inter-rater reliability is between 0.77 to 0.79 for the subscales.²³ In this study, the internal reliability using Cronbach's alpha was 0.81 for the anxiety subscale, 0.75 for the depression subscale and 0.77 for the stress subscale.

The investigator called the participants at the second and sixth weeks after intervention to remind the regular use of creams and foot-bath. To assess compliance of the interventions, the participants were asked to record application of the cream and foot-bath on a diary. They were also asked to deliver tube of the creams to the investigator at the eighth week visit to find out the amount of applied cream.

The Lavender cream and placebo were prepared by the Barij essence pharmaceutical company located in Kashan-Iran. To prepare the Lavender cream, 1.25% Lavender essential oil was added to a base cream consisting stearic acid, acetyl alcohol, vaseline, glycerin at 40 to 45°C; gently mixed and uniformed by stirring. Then it was poured into the 60g tubes and its end was pressed. The placebo cream was also contained all the essential components of the Lavender cream with no active ingredient. The creams were identical in color and

density as well as the appearance of tubes. Microbiological tests were performed to ensure the absence of any microbial contamination.

Considering 6.2 for mean and 4.2 for standard deviation of anxiety score based on the results of a study by Nik-Azin *et al.*,²⁴ a two sided significance level of 0.05 and power of 0.80, sample size was calculated (45 per group) to detect at least 40% reduction in the mean of anxiety score due to the intervention. This sample size was sufficient to detect at least 43% reduced mean depression score considering the mean depression score 7.1 (5.2) obtained from the study.²⁴

Normality of quantitative variables by the groups was confirmed using skewness and kurtosis. General linear model with repeated measures were used for comparison of the groups in terms of follow-up scores adjusted for the baseline values and stratified factor (parity). Sidak was used for multiple comparisons among the groups. Data analysis was carried out using the statistical package for social sciences SPSS for windows 13.0. p-values of less than 0.05 were considered statistically significant.

Results

Participants were recruited from May 2013 to February 2014. From the 47 participants allocated in each of the three groups, at the 4th week, one participant from the Lavender and foot-bath group, two from the control group; and at the 8th week, another participant from the control group were lost to follow-up (Figure 1).

There were no significant differences among the groups regarding baseline characteristics. Mean age of the participants was 27.7 (4.6) years and body mass index was 23.1 (2.8) kg/m². Most (81.5%) of the women had 12 years education or higher and 91.5% were housewife. About two third (62%) of the participants reported that their family income is almost enough. Most of the women (91.5%)

and their husbands (89.4%) were satisfied with the sex of the fetus (Table 1).

The number of days that they had used the creams was 26.1 in the Lavender and footbath, 25.6 in the only Lavender, and 24.2 in the placebo group during the first four weeks and 26.1, 26.3 and 23.6 days, respectively, during the second four weeks with no significant differences among the groups. The average of foot-bath in the Lavender and foot-bath group was 24.3 days in first and 23.8 days in the second four weeks. No serious side events were reported by any group.

Mean (SD) baseline scores of anxiety, stress and depression were 4.8 (2.9), 6.4 (3.4) and 4.1 (3.1) respectively with no significant differences among the groups. After adjustment for the baseline values and the number of pregnancy (stratification factor), there were significant differences among the groups in terms of stress and anxiety score sat both 4th and 8th weeks follow-ups and in terms of depression score only at the 8th week follow-up (Table 2).

Compared with the placebo group, anxiety score was not significantly different in the Lavender and foot-bath group (-1.48, -3.08 to 0.11) and was significantly lower in the only Lavender group (-2.33, -3.92 to -0.75) at the 4th week. It was significantly lower in both the Lavender and foot-bath group (-1.37, -2.60 to -0.15) and Lavender alone group (-1.66, -2.87 to -0.45) at the 8th week (Table 2, Figure 2).

At both follow-ups, stress scores were significantly lower in the Lavender and foot-bath group (-2.30, -4.13 to -0.48 and -3.12, -4.70 to -1.53, respectively) and the Lavender group (-1.93, -3.74 to -0.12 and -2.70, -4.27 to -1.13, respectively) than the placebo group (Table 2, Figure 2).

In comparison with the placebo group, depression score was not significantly different in the both Lavender and foot-bath group (adjusted difference -1.35, 95% confidence interval -3.06 to 0.35) and Lavender alone group (-1.26, -2.95 to 0.43) at

the 4th week. But it was significantly lower in the both Lavender and foot-bath group (-3.25, -4.60 to -1.91) and Lavender alone group (-2.36, -3.69 to -1.02) at the 8th week (Table 2, Figure 2).

There were significant differences in terms of none of depression, anxiety and

stress scores between the Lavender and foot-bath, and Lavender alone groups at the 4th week [-0.09 (-1.77 to -1.57), 0.85 (-0.74 to 2.44), -0.37 (-2.16 to 1.42), respectively] and the 8th week [-0.89 (-2.19 to 0.41), 0.28 (-0.91 to 1.48), -0.41 (-1.95 to 1.12), respectively] (Table 2, Figure 2).

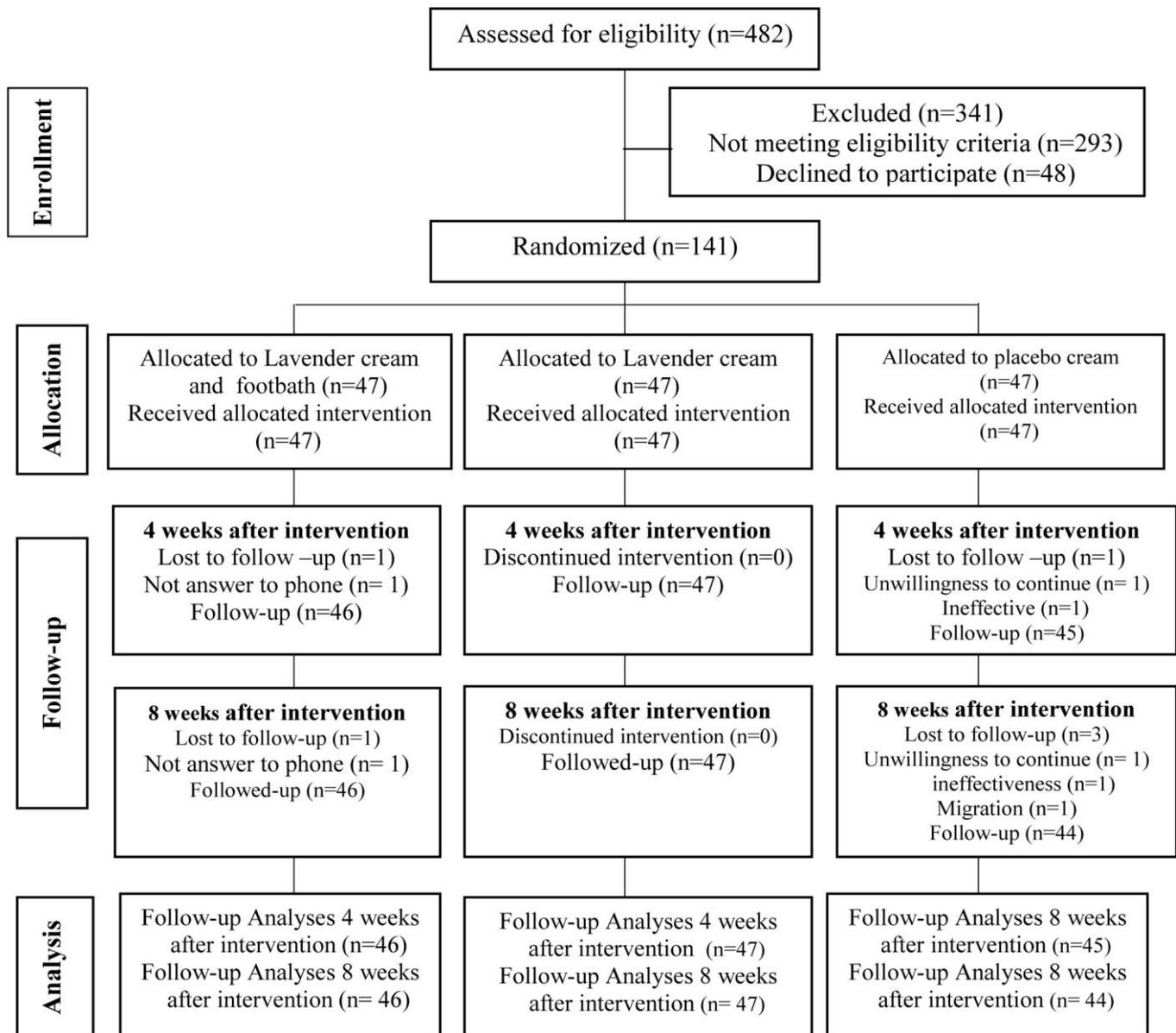


Figure 1. Study flow diagram

Table 1. Demographic characteristics of the participants by study groups

Characteristics	Lavender and footbath n=47	Lavender n=47	Placebo n=47	p
Age (years) [*]	27.0 (4.9)	28.2 (4.99)	28.1 (3.9)	0.37 [†]
Body mass index (kg/m ²) [*]	23.5 (3.2)	23.3 (2.8)	22.4 (2.4)	0.13 [†]
Education				
Guidance	6 (12.8)	5 (10.6)	3 (6.4)	0.23 [§]
High school	3 (6.4)	2 (4.3)	7 (14.9)	
Diploma	28 (59.6)	24 (51.1)	29 (61.7)	
University	10 (21.3)	16 (34.0)	8 (17.0)	
Income status				
Sufficient	11 (23.4)	13 (27.7)	10 (21.3)	0.86 [§]
Fairly adequate	27 (57.4)	31 (66.0)	30 (63.8)	
Insufficient	9 (19.1)	3 (6.4)	7 (14.9)	
Male fetus by ultrasound	24 (51.1)	28 (59.6)	22 (46.8)	0.24 [‡]
Women interest in fetal sex	42 (89.4)	43 (91.5)	44 (93.6)	0.92 ^{**}
Husband interest in fetal sex	42 (89.4)	43 (91.5)	41 (87.2)	0.79 [‡]

* Mean (SD), Data represent number (%) except otherwise indicated, [†]ANOVA, [‡]Chi-Square, [§]Linear-by-Linear, ^{**}Pearson Chi-Square

Table 2. Comparison of anxiety, stress and depression scores at different time-points in the three study groups

Variables	Lavender & footbath n=47 [*]	Lavender n=47	Placebo n=47 [†]	Difference between groups P	Comparison of two groups (MD (%95 CI))		
	Mean (SD)	Mean (SD)	Mean (SD)		Lavender & footbath with placebo	Lavender with placebo	Lavender and footbath with Lavender
Anxiety (0-21)							
Baseline	4.12 (2.89)	5.31 (3.11)	5.02 (2.71)	0.11	---	---	---
4 th week follow-up	3.47 (3.56)	3.27 (3.32)	5.44 (3.62)	0.002	-1.48 (-3.08, 0.11)	-2.33(-3.92, -0.75) [‡]	0.85 (-0.74, 2.44)
8 th week follow-up	2.52 (2.29)	2.76 (3.14)	4.30 (2.520)	0.003	-1.37 (-2.60, -0.15) [‡]	-1.66 (-2.87, -0.45) [‡]	0.28 (-0.91, 1.48)
Stress (0-21)							
Baseline	5.93 (3.25)	6.29 (3.50)	7.21 (3.63)	0.18	---	---	---
4 th week follow-up	5.84 (3.54)	6.34 (3.93)	8.57 (3.74)	0.006	-2.30 (-4.13, -0.48) [‡]	-1.93 (-3.74, -0.12) [‡]	-0.37 (-2.16, 1.42)
8 th week follow-up	5.28 (3.34)	5.82 (3.56)	8.74 (2.94)	< 0.001	-3.12 (-4.70, -1.53) [‡]	-2.70 (-4.27, -1.13) [‡]	-0.41 (-1.95, 1.12)
Depression (0-21)							
Baseline	3.68 (2.82)	3.91 (3.48)	4.80 (3.16)	0.19	---	---	---
4 th week follow-up	3.86 (3.36)	4.08 (3.38)	5.73 (4.10)	0.10	-1.35 (-3.06, 0.35)	-1.26 (-2.95, 0.43)	-0.09 (-1.77, 1.57)
8 th week follow-up	2.15 (2.32)	3.12 (2.84)	5.79 (3.18)	< 0.001	-3.25 (-4.60, -1.91) [‡]	-2.36 (-3.69, -1.02) [‡]	-0.89 (-2.19, 0.41)

One way ANOVA test is used to assess differences between groups before intervention and ANCOVA test is used to assess differences between groups after intervention by controlling the baseline values and stratified factor (parity). *n=46, n=46 at 4 and 8 weeks follow-up, respectively. [†]n=45, n=44 at 4 and 8 weeks follow-up, respectively. [‡] P<0.05

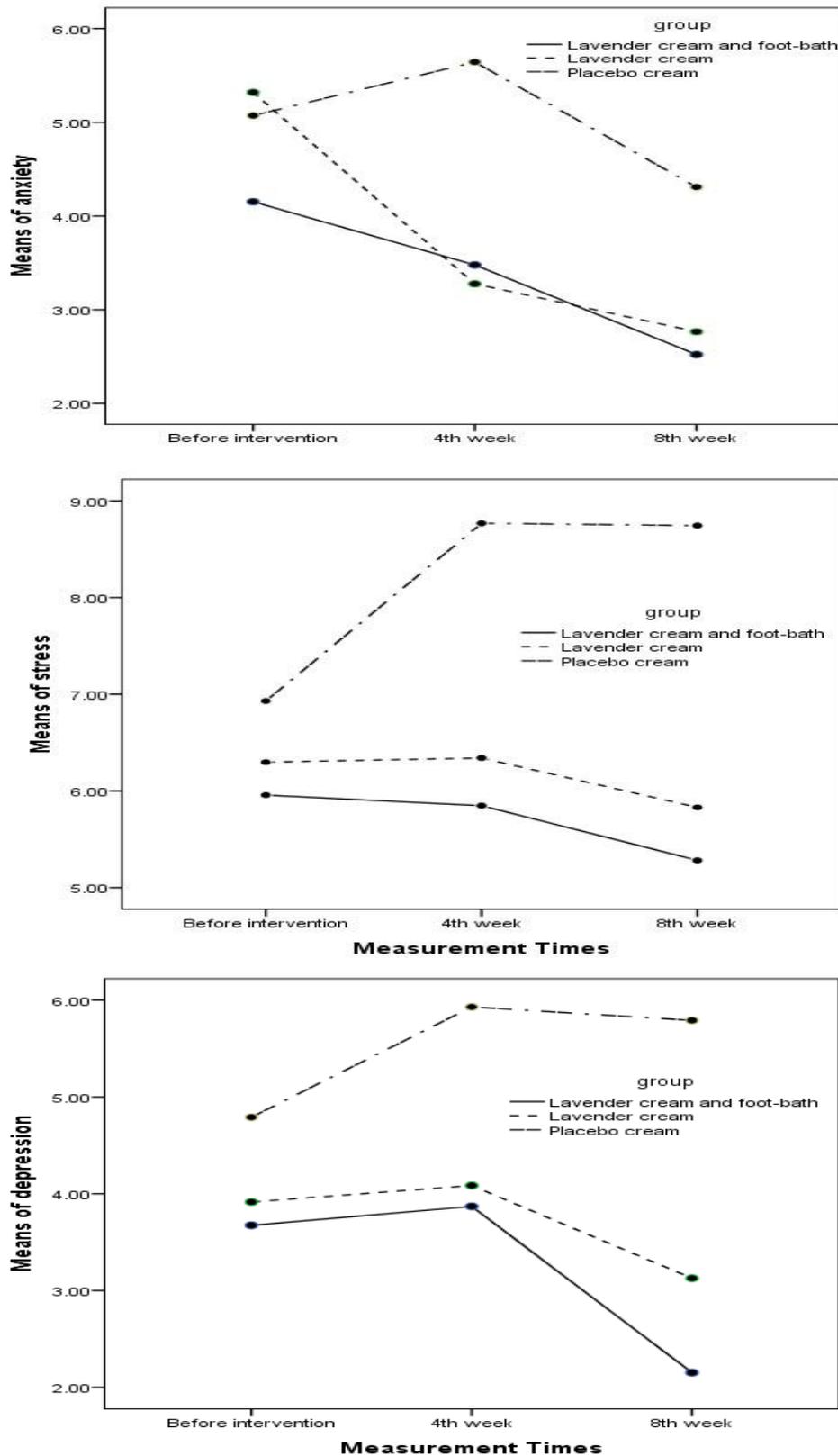


Figure 2. Mean scores of anxiety, stress and depression at different time points by study groups

Discussion

The findings of this study showed that level of anxiety, stress and depression in both Lavender and foot-bath and Lavender alone groups were lower than the placebo group at both 4th and 8th weeks follow-ups. At the 4th week follow-up, the differences were statistically significant only in terms of anxiety in the lavender group and stress in both groups. Eight weeks using Lavender cream with or without foot-bath significantly improved all the three outcomes. Adding foot-bath was not significantly improved the effectiveness.

To the best of our knowledge, this study is the first clinical trial assessing the effect of Lavender cream with and without foot-bath on the anxiety, stress and depression in pregnant women.

Lavender effect has been shown in reducing anxiety in delivery,^{24,25} before surgery²⁶ and dental procedures.¹⁵ In these studies, Lavender was used in form of inhalation²⁴ or essential oil²⁵ or massage with oil.²⁶ However, effect of Lavender inhalation on reduction of anxiety was not statistically significant in another study conducted on patients before colonoscopy.²⁷ A possible reason may be differences in method of Lavender use, groups studied or measurement scales used. It is believed that use of Lavender cream, due to inhaling scent of essential oils in the cream, could improve anxiety through decreasing amount of cortisol and increasing amount of serotonin.²⁸

Anti-stress effect of Lavender in this study is consistent with results of a study done in the United States¹⁷ which showed Lavender bath in infants decreases the cortisol level in serum and crying and stress of infants. Lavender effect has also been shown on reducing mental stress.²⁹

In a study conducted in Japan,³⁰ it is shown that Lavender, with effect on adrenal glands decrease secretion of Chromogranin A, which is a determinant stress marker. A

study conducted in Netherlands³¹ showed that Lavender, with sedative effect, decreases cortisol level and improves coronary flow. It is believed that the essential oil of Lavender, by increasing Alpha waves in the cortical region of brain, increases the sedation, and also by decreasing Beta waves in the cortical region of brain, which are related to the state of wakefulness and awareness,³² improves sleep conditions and decreases stress.³³

Also, the findings of this study about the effect of Lavender on improving the depression score are consistent with the results of a clinical trial on the patients in the outpatient department in Shahrekord-Iran who suffered from depression.¹¹ It showed that the compound of Lavender and Citalopram is more effective than Citalopram alone. The findings are also consistent with the results of a trial in Tehran-Iran,³⁴ which showed that imipramine and Lavender extract is more effective than imipramine alone, and a study conducted on female college students,³⁵ which showed that Lavender fragrance significantly decreases level of depression.

According to the biochemical studies, Linalool and Linalyl acetate consist more than 50% of Lavender composition.³⁶ It is believed that these two, along with each other, have synergic effect and show anti-stress and anti-depression property.³⁷ Mechanism of Lavender effect on the cellular level is not clear. It is believed that Lavender, by effect on the limbic system, especially on amygdala and hippocampus, applies its psychological effect. The performance of this plant is probably similar to Benzodiazepines and increases Gamma-amino butyric acid in amygdala.³⁸ In addition, the linalool existed in Lavender is effective in the level of noradrenalin and dopamine and increases them which can be one of the reasons of its anti-depressant effect.³⁹

No serious side events reporting in this study is consistent with the results of the

review,⁸ which reported no serious side-effects in the use of different forms of Lavender.

Based on the results of this study, health care providers can use the advantages of Lavender as a method to reduce anxiety, stress and depression during pregnancy to improve maternal and neonatal health. In this study, because of time limitation, there was no group receiving foot-bath along with placebo cream. Therefore, it is impossible to judge about the effect of foot-bath alone. In addition, this study has been done on healthy women with no psychological disorders and its results may not be generalizable to women suffering from psychological disorders. Further researches are suggested to determine the effects of Lavender on pregnant women with psychological disorders, on women in postpartum and the persistence of the effects after stopping its use. It will also be useful to study the effect of such interventions on maternal, fetal and neonatal outcomes. Another limitation of current study is lack of possibility to measure the level of stress markers in the blood. Considering these biochemical measurements in future studies could help to understand potential mechanisms of Lavender effects.

Conclusion

The results of current study showed that anxiety, stress and depression in pregnant women could be improved using Lavender cream with or without foot-bath.

Considering simplicity and low cost of this intervention and not occurring side events, healthcare providers who provide first level of health services, like midwives, can advise using Lavender to eligible pregnant women. Using such methods may improve quality of life and efficiency of pregnant women in such an important period.

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Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

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