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Assessment of educational intervention and Acupressure during labor on the mother's anxiety level and arterial oxygen pressure of the umbilical cord of infants (PO₂). A randomized controlled clinical Trial

Zahra Masoudi¹, Maryam Kasraeian², Marzieh Akbarzadeh³

Abstract:

BACKGROUND: Natural delivery is distressing, and the mother's anxiety in this condition can have negative impacts on the fetus, mother, and the delivery process. Hence, many women tend to use pharmacological or nonpharmacological methods for reduction of labor stress and anxiety. The aim was to assess the effect of supportive care and acupressure during labor on the mother's anxiety level and arterial oxygen pressure of the umbilical cord of infants.

MATERIALS AND METHODS: This performed on 150 pregnant women were randomly assigned to two interventions and a control group in the delivery ward of the selected educational center of Shiraz University of Medical Sciences (Shoushtari Hospital) in Iran. Mothers' anxiety scores before (beginning of the active stage of labor) and after intervention (the end of the first stage of labor) were measured using Spielberger's questionnaire. Then, infants' cord blood samples for arterial blood gas and hematologic analyses were sent to the hospital's laboratory. After all, the data with SPSS version 16 and using Pearson's correlation coefficient, one-way ANOVA, were analyzed.

RESULTS: The mean of anxiety score in the control group was 21.1% and in the supportive group and the acupressure group, respectively, decreased by 37.5% and 34.8%, respectively ($P < 0.001$). The mean of PO₂ was also reported in the maternal supportive, acupressure, and control groups, 40.4 ± 8.8 , 27.4 ± 2.8 , and 18.1 ± 3.7 , respectively. Additionally, a significant correlation was found between mothers' anxiety scores after the intervention and the mean of PO₂ ($P = 0.014$).

CONCLUSION: The supportive care and acupressure at BL32 acupoint reduced mothers' anxiety and consequently improved fetal oxygenation. Therefore, these methods are recommended to be used during labor for improving birth outcomes.

Keywords:

Acupressure, anxiety, asphyxia, blood gas analysis, doula, labor

Introduction

Pregnancy is a unique phenomenon, and women believe labor pain to be the most severe pain they have ever experienced.^[1] Birth asphyxia can lead to negative outcomes.^[2] Maternal stress during

pregnancy, while increasing the level of glucocorticoids in the fetus, has detrimental effects on the nervous structure.^[3]

Stress and release of cortisol and catechol amines can lengthen the process of labor,

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¹Department of Midwifery, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran,
²Department of Obstetrics and Gynecology, Maternal-Fetal Medicine Research Center, Shiraz University of Medical Sciences, Shiraz, Iran,
³Department of Midwifery, Maternal-Fetal Medicine Research Center, School of Nursing and Midwifery, Shiraz University of Medical Science, Shiraz, Iran

Address for correspondence:

Mrs. Marzieh Akbarzadeh, Department of Midwifery, Maternal-Fetal Medicine Research Center, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran.

E-mail: akbarzadm@sums.ac.ir

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reduce placental blood flow, and lead to fetal asphyxia.^[4]

In comparison to Apgar score, umbilical cord blood gases are a much better representative of prenatal asphyxia because Apgar score can be influenced by infant prematurity, consumption of sedative drugs or opioids, and meconium aspiration.^[5]

Umbilical cord blood gases can reveal fetus' metabolic status to a great extent. Dudenhausen *et al.* in their study said that arterial blood gas (ABG) analysis could provide critical information about fetus' past, present, and future.^[6] To date, ABG analysis is recommended in all high-risk pregnancies in both American and British colleges of nursing and midwifery.^[7]

The relationship between chronic stress and delivery outcomes indicates the need for interventions to reduce this factor.^[8] Nonpharmacological methods help women to find this feeling who they can successfully cope with the pain and stress and will less probably experience stress and tension during labor.^[9-14]

Supportive care (by doula) is one of the abovementioned methods. This care includes emotional support (continuous presence, reassurance, encouragement, and admiration), physical support (reduction of hunger, thirst, and pain), giving information about delivery process, respecting women's decision, and helping women build relationships with other health-care members.^[15] In supportive care group mothers take different position during labor that helping increase fetal descent and shortening labor process.

Different studies have shown different that acupressure at specific points could decrease anxiety and labor pain.^[11,16-18] However, in the study of Waters and Raisler,^[19] no statistically significant differences were observed between the acupressure group and the control group in terms of duration of labor. Their result is opposite of our result because in their study maternal position and acupuncture and the aforementioned acupoint (BL32 acupoint) have not been investigated. Furthermore, in other studies in the supportive care group, there was either only emotional support or teaching or the use of some limited positions and both interventions were not found together in other studies. Therefore, the researcher decided to perform these two simple interventions in the delivery room and compare them to determine the most effective nonpharmacological method that can be applied by midwives.

Materials and Methods

Study design and setting

This randomized clinical trial was conducted in the delivery ward of the selected hospital of Shiraz

University of Medical Sciences in Shoushtari Mother and Child Hospital which is the top hospital in promoting natural childbirth in Iran in 2018.

Study participants and sampling

According to a pilot sample, for comparing maternal anxiety between the supportive care and acupressure groups, the postintervention mean and standard deviation of these two groups were 34.42 ± 5.69 and 39.82 ± 8.82 , respectively.

Then, considering $\beta = 0.1$, $\alpha = 0.05$, $S_1 = 5.69$, $S_2 = 8.82$, $\mu_1 = 34.42$, and $\mu_2 = 39.82$, 41 subjects were estimated to be needed in each group. However, considering a

possible dropout of 20% $\left(n' n \times \frac{1}{1-p} \right)$, the sample size

was determined to be 50 cases in each group [Figure 1]:

$$n = \frac{(S_1^2 + S_2^2)(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2}{d^2} = 41$$

$$d = \mu_1 - \mu_2 = 5.4 \quad \alpha = .05 \quad 1 - \beta = 0.9$$

$$z_{1-\frac{\alpha}{2}} = 1.96 \quad z_{1-\beta} = 1.28$$

After sample size calculation, permuted block randomization was used to assign patients into three groups in a 1:1 ratio. Then, fifty blocks of three were prepared and the patients were consecutively assigned to the blocks until the sample size in each group was completed.

The inclusion criteria of the study were being pregnant, aging 18–35 years, term singleton pregnancy, having no history of clinical, mental, or surgical problems (patient records and self-report), having experienced no problems during pregnancy, willingness to participate in the research, and signing written informed consent forms. The participants' uterine contractions had started spontaneously. In addition, their cervical dilatation was 3–4 cm and the contractions were repeated with duration >30 s at admission (based on manual contraction measurements). Exclusion criteria include high-risk pregnancy. If mothers had inclusion criteria researcher take informed consent. Sampling time has begun with maternal entry into labor.

Data collection tool and technique

The data collection form consists of three parts. Part A contains the demographic information of the mother (age, number of pregnancies, abortions, live children, the problems of previous pregnancies and current pregnancy, disease history, drug use in this pregnancy, etc.), completed by observation and interview, and part B for infant information after birth,

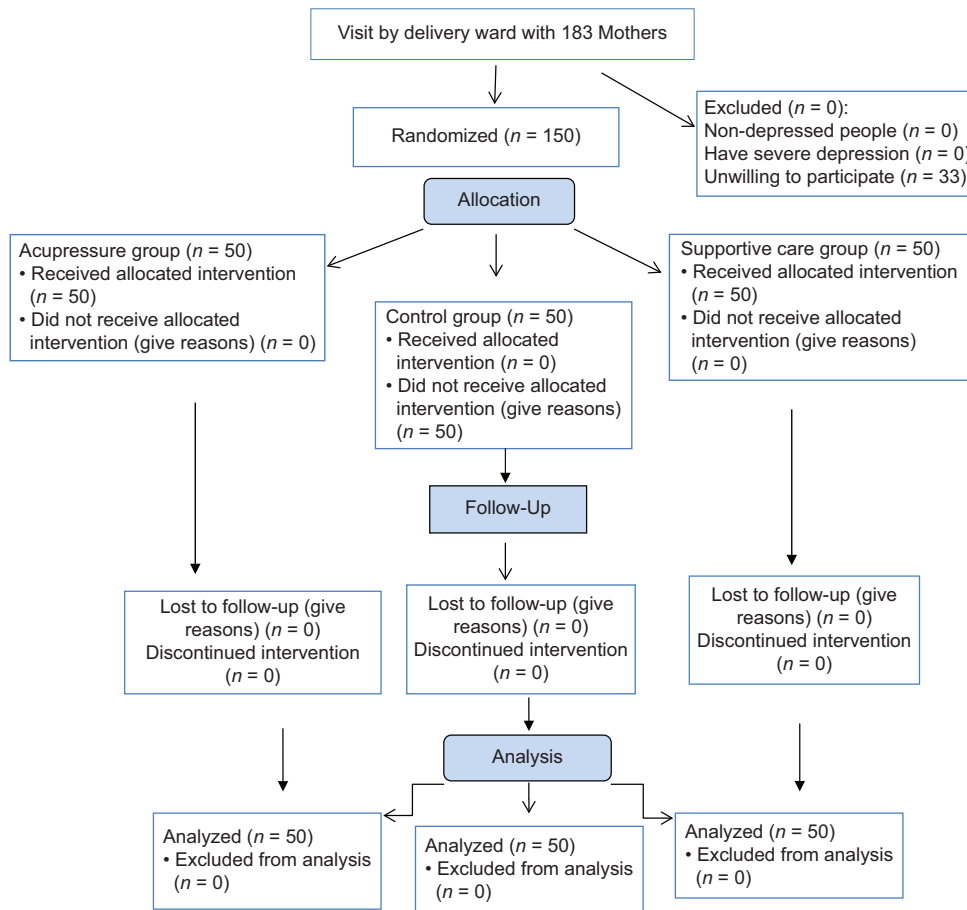


Figure 1: Consort of samples

and part C containing a checklist completed after the submission of test results. Part D contains the anxiety questionnaire (Spielberger) that was answered by the mother at the beginning of the active stage of labor and at the end of the first stage of labor.

In the supportive care group, researcher midwife (in the role of doula) accompanied the mother since admission, supported her both physically and psychologically, and encouraged her to get into appropriate positions to cervical dilatation in different stages of labor. In 3–8 cm dilatation, the mother was placed in activity positions, such as straddle a chair, leaning, tailor stretching, and lunge, for 10 min and in relaxing positions, such as semi-sitting and side-lying, for 10 min. Since 8–10 cm dilatation, the mother was placed in effective positions in fetal descent, such as dangle, squatting, and hands and knee [Figure 2].^[20,21]

In the acupressure group, pressure was applied on BL32 acupoint at 3–4 and 7–8 cm dilatations. BL32 acupoint is located in the second sacral foramen. This acupressure point lies midway between the dimples above the buttocks and the lumbar spine. It lies approximately one index finger length above the top of the buttock

crease, approximately one thumb width either side of the spine [Figure 3].^[22,23] The pressure was deeply and continuously applied during contractions for 30 min. In other words, applying pressure was started at the beginning and stopped at the end of contractions. Of course, the researcher was trained regarding performance of acupressure by a physical medicine and rehabilitation specialist. The correctness of the researcher's intervention was confirmed by the rehabilitation specialist.

In the control group, the hospital's routine care were performed and the participants were monitored indirectly.

The State-Trait Anxiety Inventory (STAI) of Spielberger question near is a commonly used measure of trait and state anxiety.^[24] This test was performed by Aghamohammadi in 2008 in 150 patients who underwent surgery in Iran and 97% reliability was reported. The validity and reliability of the study of Aghamohammadi is the basis of this study.^[25]

The anxiety questionnaire in the supportive care and acupressure groups before and after intervention and in the control group at the beginning of the active phase and

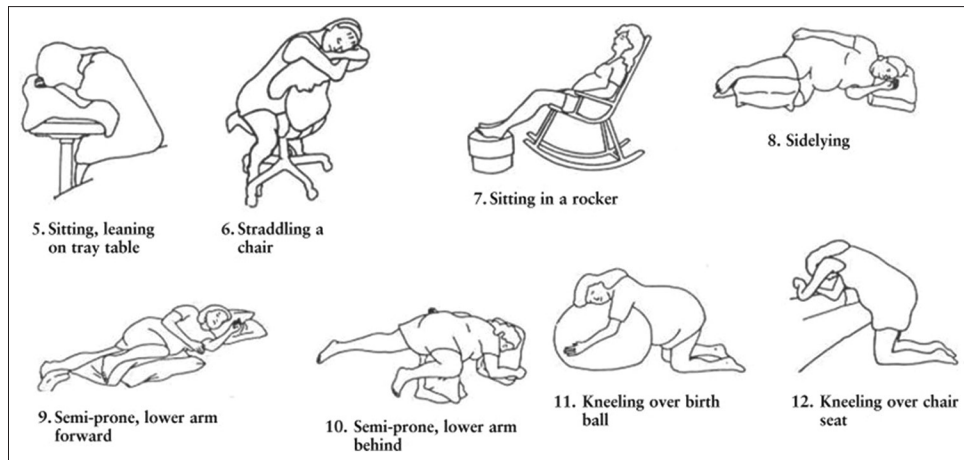


Figure 2: Different positions in labor

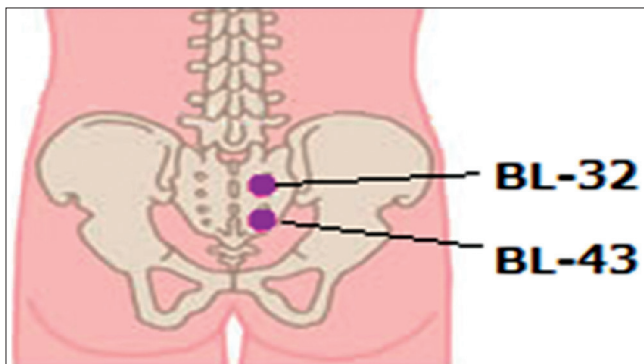


Figure 3: Location of the BL32 point

the end of the first stage of the labor was answered by the mother. The questionnaire by the mother in the labor room was completed. Hence, labor room was separated for each mother by partition.

After delivery, before, or at the time of the first breath, the infants' umbilical cords were double clamped and their Apgar scores were recorded. Then, 1 cc of cord blood was taken using an insulin syringe that had been heparinized by 1000-unit heparin and its dead space had been filled with heparin. The samples were placed on ice and sent to the hospital's laboratory for ABG and hematologic analyses.

Data analysis

Chi-square test uses for comparisons age, education level and mother's occupation among the three groups. One-way ANOVA use for showed mean score of anxiety before and after the intervention between the three groups. Pearson's correlation coefficient comparison of the relationship between the maternal anxieties after intervention on PO₂ average in the three groups. All analyses were performed using the SPSS statistical software, version 16((IBM Company Armonk, NY, USA)), and $P < 0.05$ was considered to be statistically significant.

Ethical consideration

This research project was approved by the local ethics committee of Shiraz University of Medical Sciences, and written informed consent was obtained from all the participants. (Grant No. 6356) financially supported by Shiraz University of Medical Sciences. The research in Iranian Registry of Clinical Trials has registered with registration number: IRCT 2013081411706N3.

Results

The results of Chi-square test indicated no significant difference among the three groups regarding age distribution ($P = 0.496$). The results also revealed no significant difference among the three groups with respect to education level ($P = 0.584$) and mother's occupation ($P = 0.781$). The mean of gestational age was 38.8 ± 1.3 , 39.2 ± 1.2 , and 38.8 ± 0.99 for the supportive care, acupressure, and control groups, respectively. Moreover, the results of one-way ANOVA showed no significant difference among them in this regard ($P = 0.158$) [Table 1].

According to the results of one-way ANOVA, the three groups were similar concerning the mean score of anxiety before the intervention ($P = 0.354$). After the intervention (end of the first stage of labor), the mean score of anxiety increased by 21.1% in the control group but decreased by 37.5% in the supportive care group and by 34.8% in the acupressure group. The difference among the three groups was statistically significant ($P < 0.001$) [Table 2].

Paired sample *t*-test shows a significant decrease in the supportive care and acupressure groups and a significant increase in the control group after the intervention ($P < 0.001$). Bonferroni *post hoc* for changes in anxiety scores showed a significant difference between the supportive care and control groups ($P < 0.001$) and also between the acupressure and control groups ($P < 0.001$) [Table 2].

Table 1: Demographic characteristic of the three groups (n=50)

Variables	Group	Supportive care, n (%)	Acupressure, n (%)	Control group, n (%)	Total, n (%)	P
Education	Primary school	18 (36)	25 (50)	22 (44)	66 (43.30)	0.584
	Secondary school	17 (34)	15 (30)	18 (36)	50 (33.30)	
	University	15 (30)	10 (20)	10 (20)	35 (33.30)	
Job	House work	36 (72)	39 (78)	37 (74)	112 (74.70)	0.781
	Employment	14 (28)	11 (23)	13 (26)	38 (25.30)	
Gestational age	Mean±SD	38.85±1.32	39.17±1.15	38.73±0.99	38.92±1.17	0.158

SD=Standard deviation

Table 2: The mothers' mean score of anxiety (state and trait) before and after the intervention in the three groups (n=50)

Anxiety assessment times	Mean±SD			P	DF	F
	Supportive care	Acupressure	Control			
Before the intervention	56.89±2.68	57.61±3.67	57.64±2.26	0.354	2	1.046
After the intervention	35.58±5.86	37.51±9.11	69.89±6.61	<0.001	2	345.69
Changes in anxiety scores*	-20.58±8.07	-20.08±7.25	11.18±9.56	<0.001	2	237.31
T ^a (P)	18.83 (<0.001)	19.58 (<0.001)	8.26 (<0.001)			

*Paired t-test. Significance level: P<0.05. SD=Standard deviation

The results of Pearson's correlation coefficient revealed an increase in PO₂ with decrease in anxiety in the supportive care and acupressure groups after the intervention. However, increase in mothers' anxiety in the control group resulted in a significant decrease in PO₂ [Table 3].

Discussion

Results showed that the three groups were similar with respect to the mothers' mean score of anxiety before the intervention. However, the mean score of anxiety increased in the control group and decreased in the supportive care and acupressure groups, and the difference among the three groups was statistically significant. In other words, the mean score of anxiety reduced by 20.5 points in the supportive care group and by 20 points in the acupressure group but increased by 11.1 points in the control group.

Considering the supportive care group, the present study results are in agreement with other researches. Other studies have shown that prenatal interventions and psychological support for mothers during childbirth reduce anxiety, pain intensity, and interventions such as episiotomy and CS.^[26-28] However, the difference between these studies and the present study is that prenatal education class during pregnancy by audio-visual instruments like videos of natural delivery has been held, but in the present study, it was done at the time of labor and by doula. However, the results of both methods have been shown to reduce maternal anxiety. Intrauterine hypoxia is an important risk factor of infant mortality and abnormal outcomes during infancy which causes problems in 5%–10% of pregnancies.^[29,30]

Thus, by increasing uterine artery vascular resistance and decreasing oxygenation, mother's anxiety plays a critical

Table 3: Comparison of the relationship between the maternal anxiety after intervention on PO₂ average in the three groups

Group	Mean±SD		R	P
	Maternal anxiety score after the intervention	PO ₂		
Supportive care	35.58±5.86	40.43±80/8	-0.388	0.005
Acupressure	37.51±9.11	41.27±81/2	-0.843	<0.001
Control	69.89±6.61	18.11±3.70	-0.724	<0.001

SD=Standard deviation

role in the incidence of maternal and fetal complications. This clarifies the necessity to perform interventions to decrease mother's anxiety during labor. Evidence has indicated that acupressure effectively stimulated brain responses and hormone activities, increased blood flow, and adjusted metabolism, eventually controlling and decreasing anxiety.^[31] Similar to the current study, Chao *et al.* reported that acupressure was effective in reduction of women's pain and anxiety during labor.^[32] Although the study by Chao *et al.*, Which deals with subcutaneous electrical nerve stimulation (TENS), is somewhat different from acupressure, but may be able to suggest that they may have similar mechanisms.

In our study, the score of anxiety reduced by 34.8% in the acupressure group after the intervention. According to Table 2, the highest and lowest scores of anxiety were related to the control and supportive care groups, respectively, after the intervention. In other words, the mean of PO₂ was higher in the supportive care group, while it was lower in the control group compared to the two intervention groups.

Increased production of maternal catecholamine resulting from feeling anxious decreases the strength,

duration, and coordination of uterine contractions and consequently increases the duration of labor. Indeed, increased secretion of epinephrine could lead to vasoconstriction and fetal hypoxia.^[33] Overall, effective and continuous support during labor turns off the fear-stress-pain cycle.^[34,35] Results of several studies have demonstrated that acupressure could lead to release of neurotransmitters, such as serotonin, which could influence individuals' tranquillity.^[11,36,37] Other studies have indicated that specific peptides with analgesic properties are released during acupressure, which reduce the activity of sympathoadrenal system that is activated while feeling anxious, for example, during labor.^[38,39] Moreover, Rebecca *et al.* stated that hydrotherapy as a nonpharmacological method during labor decreased anxiety and affects neuroendocrine responses that modify psychophysiological processes. They said, "it seems reasonable to speculate that decreased contraction frequency and improved uterine perfusion could facilitate a return to normal contraction synchrony, intensity and frequency, thereby decreasing pain and dysfunction."^[40] That is the strength of the plan. In other studies, the effect of supportive care and acupressure on maternal anxiety has been investigated separately. Our study's effect was to compare the effects of two interventions. In the current study, mental and physical relaxation in the supportive care group helped reduce the mothers' anxiety, which in turn improved fetal oxygenation and increased PO₂. In the acupressure group also, reduction of mothers' anxiety resulted in improvement of fetal oxygenation and enhancement of PO₂ compared to the control group.

Limitation and recommendation

There was no specific limitation during the implementation of the plan. Only one of the problems was the small size of the labor room to use the tools for various maternal positions. Another limitation, maternal pain may affect the mother's response to the questionnaire, which has not been controlled by the researcher. This study was new because of new acupressure point and supportive care that was different. It is recommended that the following suggestions be considered for future research.

1. The effect of widespread support of midwives (doula) from the beginning of pregnancy to postpartum
2. Comparison of the effect of acupressure with other pharmacological and nonpharmacological methods of reducing anxiety
3. Comparison of mothers' satisfaction with supportive care and acupressure
4. The effect of supportive care and acupressure on the intensity of maternal and infant attachment and breastfeeding success
5. Comparison of the effect of acupressure and supportive care on low back pain during childbirth with other nonpharmacological sedatives.

Conclusion

Doula's supportive care and application of acupressure during labor decreased anxiety, tensions, and a desirable experience. Reduction of mother's anxiety in the two intervention groups compared to the control group improves fetal oxygenation and prevents hypoxia. Therefore, it is recommended that careful, large randomized controlled trials be conducted to clarify the mechanisms of action of acupressure and supportive care and its effects on labor and delivery progress. The knowledge gained from this and future studies can be done directly in clinical practice by nurses, midwives, and obstetricians at childbirth who are willing to perform noninvasive, low-risk methods to improve the condition of the mother and the mother's mental state.

Acknowledgement and ethical approval

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Conflicts of interest

There are no conflicts of interest.

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