

• Research Article

Effectiveness of breathing exercises during the second stage of labor on labor pain and duration: a randomized controlled trial

Hilal Yuksel¹, Yasemin Cayir¹, Zahide Kosan², Kenan Tastan¹

1. Department of Family Medicine, Ataturk University Faculty of Medicine, Erzurum 25070, Turkey

2. Department of Public Health, Ataturk University Faculty of Medicine, Erzurum 25070, Turkey

ABSTRACT

BACKGROUND: Some research exists on the effect of non-pharmacological approaches for labor pain relief. However, there is limited information about effectiveness of breathing exercises in pregnant women to reduce maternal pain during labor.

OBJECTIVE: To determine whether breathing exercises for pregnant women during the second stage of labor have beneficial effects on maternal pain, duration of labor, and the first-minute Appearance, Pulse, Grimace, Activity and Respiration (APGAR) scores.

DESIGN, SETTING, PARTICIPANTS AND INTERVENTIONS: This randomized clinical trial involved 250 pregnant women, who were randomly divided into two groups: intervention group (IG; $n = 125$) and control group (CG; $n = 125$). IG received one session breathing exercise training and performed breathing exercises during the second stage of labor versus the CG that did not receive any breathing exercise training.

MAIN OUTCOME MEASURES: The effects of breathing exercises on maternal pain were determined by Visual Analogue Scale (VAS), duration of the second stage of labor, and the first-minute APGAR scores.

RESULTS: The mean age of the participants was (23.2 ± 4.2) (range: 18 to 42) years. Both IG and CG had similar baseline characteristics in terms of age, education level, occupation, and smoking ($P > 0.05$). The mean VAS scores of IG and CG were (88.2 ± 6.3) and (90.5 ± 7.0), respectively ($P < 0.001$). The duration of the second stage of labor was (369.6 ± 92.0) s for IG and (440.7 ± 142.5) s for CG ($P < 0.001$). The mean first-minute APGAR scores were (8.84 ± 0.50) for IG and (8.73 ± 0.89) for CG ($P > 0.05$).

CONCLUSION: Based on this study, breathing exercises with deep inhalation and exhalation in pregnant women are effective in reducing the perception of labor pain and shortening the duration of the second stage of delivery. Therefore, we recommend breathing exercises as an effective modality for labor pain management and shortening the duration of labor.

TRIAL REGISTRATION: This study is registered on the website of ClinicalTrials.gov (www.clinicaltrials.gov) with the number of NCT03066973.

Keywords: breathing exercise; labor pain; labor time; labor pain management; visual analogue scale; randomized controlled trial

Citation: Yuksel H, Cayir Y, Kosan Z, Tastan K. Effectiveness of breathing exercises during the second stage of labor on labor pain and duration: a randomized controlled trial. *J Integr Med.* 2017 September; Epub ahead of print.

[http://dx.doi.org/10.1016/S2095-4964\(17\)60368-6](http://dx.doi.org/10.1016/S2095-4964(17)60368-6)

Received April 28, 2017; accepted June 27, 2017.

Correspondence: Yasemin Cayir, MD, Associate Professor. E-mail: dryasemincayir@yahoo.com



1 Introduction

Normal, uncomplicated vaginal birth is a physiological process that is safer than cesarean section, and reduces the mother's length of hospital stay.^[1] However, pain and anxiety during labor may negatively affect this physiologic process.^[2,3] In cases of women who have fear regarding birthing pain and complications, cesarean delivery is preferred over vaginal delivery.^[4] Maternal request is also an important factor which increases (elective) cesarean delivery rates.^[5] According to the World Health Organization, the ideal cesarean rate is accepted as 10% to 15%,^[6] but 45% of the babies in Turkey were born through cesarean delivery, according to community-based studies. Therefore, women in Turkey need appropriate education in order to select vaginal birth as the birth route of choice.

Labor pain management is important in reducing the rate of increased elective cesarean section. Cervical dilatation and intensive uterine contractions causes labor pain that is a progressive pain with gradually increasing severity. The pain in the first stage of labor is a visceral pain and cannot be localized well. However, in the second stage of labor, pain is more intense and well located in the lower part of the abdomen.^[7] Several non-pharmacological methods can be performed to reduce labor pain. The methods of labor pain management should be simple and reliable, and should also maintain fetal hemostasis.^[8] Studies have shown acupuncture and hypnosis to be beneficial for the management of pain during labor.^[9] Also, usage of relaxation techniques like massage and breathing exercises can reduce stress and anxiety during labor.^[10] Although some non-pharmacological methods are non-invasive, safe for both the mother and infant, and are supported by scientific evidence, other techniques lack such evidence of efficacy.^[11] Studies with non-pharmacological methods mainly focused on their effects on maternal pain or anxiety management. However, there are limited numbers of studies investigating the effects of these methods on newborns. In addition, it has been shown that the respiratory pattern previously applied at the first stage of labor has no significant effect on pain, fatigue, and maternal satisfaction.^[2]

The present study aimed to assess the efficacy of breathing exercises during the second stage of labor for maternal pain, duration of labor, and first-minute Appearance, Pulse, Grimace, Activity and Respiration (APGAR) scores of the newborn.

2 Methods and materials

2.1 Study design

This randomized controlled trial was designed to

compare nulliparous pregnant women in the second stage of labor who performed breathing exercises as instructed, versus a control group who received standard care. The study was conducted at Nenehatun Obstetrics and Gynecology Hospital between May 2016 and June 2016, in Erzurum, Turkey. The study was conducted in accordance with the Consolidated Standards of Reporting Trials Statement.^[12] This study is registered on the website of ClinicalTrials.gov (www.clinicaltrials.gov) with the number of NCT03066973.

2.2 Inclusion and exclusion criteria

Inclusion criteria were as follows: being a nulliparous pregnant woman with a gestational age ranging between 37 and 42 weeks. Those using analgesics or anesthetics, and those with clinical instability, psychiatric disorders and the inability to cooperate with breathing exercises were excluded. The sample size was calculated using data obtained in a pilot study conducted with 140 patients. A total of 112 patients in each group provided a statistical power of 80%. There was a difference of 30% reduction in pain with the use of breathing exercises in both groups with an α error of 5%. Considering a possible 10% loss rate, 250 women were selected for the study. The patients were either randomized to the intervention group (IG; $n = 125$) or control group (CG; $n = 125$) using computer-generated randomization lists (stratified randomization with random allocation sequences to ensure closely balanced groups).

The study protocol was approved by the Ethics Committee of Ataturk University, Faculty of Medicine (Number of the Ethic Committee Report: B.30.2.ATA.0.01.00/69). An informed written consent was obtained from each participant. The study was conducted in accordance with the principles of the Declaration of Helsinki.^[13]

2.3 Intervention

Pregnant women in the IG received one session breathing exercises in the first stage of labor. The training of breathing exercise was given by the principal investigator. Before the training, all women in the IG were given brochures with directions to be able to work on their own. During training, all participants were instructed to perform abdominal breathing during the second stage of birth.^[14] The main components of breathing exercises during training were as follows: (A) First, fill your stomach and then your lungs with air while breathing in; (B) Feel the expansion in the stomach; (C) Make sure the muscles from your stomach to your knee are relaxed, as if you are urinating while breathing out; (D) When there is pain, perform deep abdominal breathing exercises, and take a deep breath in and hold as much as you can; (E) Try to push the baby downward; (F) You can do it by holding your breath or

breathing out quite slowly from your mouth; (G) The most important point in this stage is that you should not fill up the stomach with air, and you should push downward to deliver the baby; (H) You should continue the pushing until the pain is relieved.

The participants were observed during the entire second stage, and their breathing progress was monitored.

2.4 Data collection

The primary outcome was maternal pain, while the secondary outcome was the duration of the second stage of labor. The first-minute APGAR score was considered a secondary fetal outcome.

The Visual Analogue Scale (VAS) ranging from 0 to 100 was used to evaluate the pain severity in nulliparous pregnant women, where 0 indicates total absence of pain and 100 indicates maximum pain. To measure pain severity, the results marked by each participant on a 0–100 mm VAS were obtained at the second stage of labor.

To measure the effect of breathing exercises on the duration of the second stage of delivery, duration of the second stage was recorded in seconds for all participants. The first-minute APGAR scores of the infant were also recorded, as evaluated on delivery by the on-duty pediatrician in the birthing room. All data collection was done by the principal investigator.

2.5 Data analysis

Statistical analysis was performed using SPSS version 20.0 software (IBM Corp., Armonk, NY, USA). Numerical variables are expressed in mean ± standard

deviation and categorical variables in numbers and percentages (%). Numerical data were analyzed for normal distribution. Independent sample *t*-test and χ^2 test were used to analyze the differences between the groups. $P < 0.05$ was set as the threshold for significance.

3 Results

The flow chart of the parturients is shown in Figure 1. A total of 626 parturients were assessed, of which 237 were excluded. There was no loss to follow-up for any reason. None of the participants were withdrawn early from the study.

The mean age of the participants was 23.2 ± 4.2 (range: 18 to 42) years. Both IG and CG had similar baseline characteristics in terms of age, education level, occupation, and smoking status ($P > 0.05$). Baseline characteristics of participants are shown in Table 1.

The mean gestational age was (39.48 ± 0.82) weeks in the IG and (39.47 ± 0.79) weeks in the CG ($P > 0.05$). A total of 91.2% ($n = 114$) of the women in the IG group and 94.4% of the women in the CG had no comorbidities ($P > 0.05$). The comorbidities were to have hypothyroidism, hepatitis B carriage, and migraine. The mean birth weight of the newborns was ($3\ 044.0 \pm 437.3$) g in the IG and ($2\ 964.6 \pm 534.1$) g in the CG ($P > 0.05$).

Comparisons of mean maternal pain during labor, duration of the second stage of labor and the first-minute APGAR scores of infants between groups are shown in Table 2. All the first-minute APGAR scores were ≥ 7 .

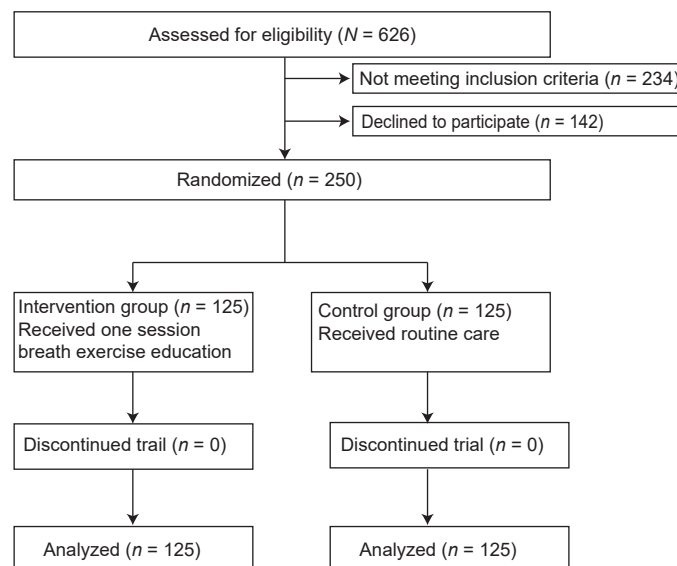


Figure 1 Flow-chart of the patients



Table 1 Overview of participants characteristics

Variables	Intervention group (n = 125)	Control group (n = 125)	P value
Age (years, mean ± standard deviation)	23.5 ± 4.6	22.8 ± 3.8	> 0.05
Education level (n, %)			> 0.05
Primary school	50 (40.0%)	42 (33.6%)	
Middle school	51 (40.8%)	51 (40.8%)	
High school	18 (14.4%)	27 (21.6%)	
University	6 (4.8)	5 (4.0%)	
Occupation (n, %)			> 0.05
Professional	124 (99.2%)	122 (97.6%)	
Housewife	1 (0.8%)	3 (2.4%)	
Smoking (n, %)			> 0.05
Smoker	5 (4.0%)	1 (0.8%)	
Nonsmoker	120 (96.0%)	124 (99.2%)	

Table 2 Comparison of mean maternal pain, duration of the second stage of labor and the first-minute APGAR score between groups

Dependent variable	Intervention group (n = 125)	Control group (n = 125)	P value
Maternal pain	88.2 ± 6.3	90.5 ± 7.0	0.000
Duration of the second stage (s)	369.6 ± 92.0	440.7 ± 142.5	0.000
APGAR (first-minute)	8.84 ± 0.50	8.73 ± 0.89	0.255

Data were expressed as mean ± standard deviation. Maternal pain were measured by Visual Analogue Scale. APGAR: Appearance, Pulse, Grimace, Activity and Respiration.

4 Discussion

The results of this randomized control trial indicated that breathing exercises provided significant pain control in the second stage of labor. Fetal presentation came down in the second stage of labor, and it produced a reflex by the compression in the bladder and rectal area that generated a strong urge to push. As a result, a combination of involuntary and voluntary uterine contractions helped with delivery of the fetus in this stage. Strategies to facilitate voluntary uterine contractions can help to control the second stage of labor.^[15] Breathing exercises can facilitate pain control as an effective method to reduce pressure exerted on the perineum, as well as reduce the urge to push in the mother. The baby’s head pushes and expands the uterine muscles, and pressure of the baby’s head causes the contractions. At the same time, increased pressure resulting from uterine contractions during the push is counteracted by deep breathing.^[14,16] This may be the mechanism by which breathing techniques reduce pain during the second stage of labor.

Using appropriate breathing techniques during labor can be effective in facilitating fetal descent.^[17] In our study, breathing exercises were performed particularly in the second stage of labor, which is typically the more painful period, and the breathing group reported lower maternal pain scores than the control group. Another

investigation has been conducted to evaluate whether non-pharmacological methods can reduce labor pain, and hypnosis has been demonstrated as better pain control compared to the mothers receiving only support during labor.^[18] In a study conducted in Nigeria, breathing exercises were observed to be the most common method coping with non-pharmacological labor pain among women, where 28% of the women were familiar with the use of this method.^[19,20] Deep inhales and exhales performed in the breathing exercise during labor provide mobilization of the pelvic floor muscles, and abdominal muscles are actively contracted and oxygenated.^[21]

In the present study, the second stage of labor was shorter in the intervention group who received breathing training. The pain was localized to the lower abdomen in the second stage of labor, and pain can be managed more effectively through breathing exercises to facilitate labor. This method can also be effective in shortening the duration of the second stage. However, there are plenty of factors that can affect the duration of the second stage of labor. If the mother is not able to push, this stage may be prolonged. In our hospital setting, delivery of oxytocin, amniotomy, and episiotomy are routinely performed. Since the routine practices of the hospital must be followed, these procedures were applied to both study groups, therefore obscuring how the intervention may have affected these factors. The actively accelerated

labor resulted in shortened expected mean rate (about 50 min in primipara) for the second stage, consistent with previous reports in the literature. Also, comorbid medical conditions like obesity, hypertension, diabetes and nutritional factors of participants can affect duration of the second stage.^[22]

There are limited literature studies that assess the relationship between breathing exercises and APGAR scores of the newborns. The mean first-minute APGAR scores of the newborns were used to determine whether the practices performed in our study were influential on the newborn health. We found no significant difference between the groups in terms of the mean APGAR scores of the newborns, which is consistent with previous study findings.^[2] This finding is important as it showed that the implementation had no effect on the fetus.

There are some limitations of this study. One was not having controlled variables that may influence the results. First, usage of oxytocin, amniotomy and epistomy can be thought as confounding factors of the study. Usage of these factors was not compared between the groups. Also there may have been underlying medical comorbidities such as obesity, hypertension, gestational diabetes and nutritional factors that might limit the interpretation of the study. Another limitation may be that the study was not blinded, which could have resulted in women giving the “right answers” to questions regarding pain scores as a courtesy bias. However, to the best of our knowledge, this is the first trial evaluating the breathing exercises during the second stage of labor on maternal pain, duration of labor, and first-minute APGAR scores.

In conclusion, based on our study results, deep breathing exercises can be considered as an effective method to ensure pain relief during labor. However, further prospective, large-scale, randomized controlled trials are required to assess whether breathing exercises are of value for pain management during labor and childbirth.

5 Conflict of interest

The authors declare that there is no conflict of interest.

6 Acknowledgements

We are thankful to all participants for their contribution.

REFERENCES

- 1 Marshall NE, Fu R, Guise JM. Impact of multiple cesarean deliveries on maternal morbidity: a systematic review. *Am J Obstet Gynecol*. 2011; 205(3): 262 e1–e8.
- 2 Boaviagem A, Melo Junior E, Lubambo L, Sousa P, Aragão C, Albuquerque S, Lemos A. The effectiveness of breathing patterns to control maternal anxiety during the first period of labor: a randomized controlled clinical trial. *Complement Ther Clin Pract*. 2017; 26: 30–35.
- 3 Adams ED, Bianchi AL. A practical approach to labor support. *J Obstet Gynecol Neonatal Nurs*. 2008; 37(1): 106–115.
- 4 Stjernholm YV, Petersson K, Eneroth E. Changed indications for cesarean sections. *Acta Obstet Gynecol Scand*. 2010; 89(1): 49–53.
- 5 Akarsu RH, Mucuk S. Turkish women’s opinions about cesarean delivery. *Pak J Med Sci*. 2014; 30(6): 1308–1313.
- 6 Saleh AM, Dudenhausen JW, Ahmed B. Increased rates of cesarean sections and large families: a potentially dangerous combination. *J Perinat Med*. 2017; 45(5): 517–521.
- 7 Kuczowski KM. Labor pain and its management with the combined spinal-epidural analgesia: what does an obstetrician need to know? *Arch Gynecol Obstet*. 2007; 275(3): 183–185.
- 8 Simkin P, Bolding A. Update on nonpharmacologic approaches to relieve labor pain and prevent suffering. *J Midwifery Womens Health*. 2004; 49(6): 489–504.
- 9 Smith CA, Collins CT, Crowther CA, Levett KM. Acupuncture or acupressure for pain management in labour. *Cochrane Database Syst Rev*. 2011; (7): CD009232.
- 10 Miquelutti MA, Cecatti JG, Makuch MY. Evaluation of a birth preparation program on lumbopelvic pain, urinary incontinence, anxiety and exercise: a randomized controlled trial. *BMC Pregnancy Childbirth*. 2013; 13: 154.
- 11 Jones L, Othman M, Dowswell T, Alfirevic Z, Gates S, Newburn M, Jordan S, Lavender T, Neilson JP. Pain management for women in labour: an overview of systematic reviews. *Cochrane Database Syst Rev*. 2012; (3): CD009234.
- 12 Begg C, Cho M, Eastwood S, Horton R, Moher D, Olkin I, Pitkin R, Rennie D, Schulz KF, Simel D, Stroup DF. Improving the quality of reporting of randomized controlled trials. The CONSORT statement. *JAMA*. 1996; 276(8): 637–639.
- 13 WMA declaration of Helsinki Serves as guide to physicians. *Calif Med*. 1966; 105(2): 149–150.
- 14 Ahmadi Z, Torkzahrani S, Roosta F, Shakeri N, Mhmoodi Z. Effect of breathing technique of blowing on the extent of damage to the perineum at the moment of delivery: a randomized clinical trial. *Iran J Nurs Midwifery Res*. 2017; 22(1): 62–66.
- 15 Lemos A, Amorim MM, Dornelas de Andrade A, de Souza AI, Cabral Filho JE, Correia JB. Pushing/bearing down methods for the second stage of labour. *Cochrane Database Syst Rev*. 2015; (10): CD009124.
- 16 Simpson KR, James DC. Effects of immediate versus delayed pushing during second-stage labor on fetal well-being: a randomized clinical trial. *Nurs Res*. 2005; 54(3): 149–157.
- 17 Yildirim G, Sahin NH. The effect of breathing and skin stimulation techniques on labour pain perception of Turkish women. *Pain Res Manag*. 2004; 9(4): 183–187.
- 18 Madden K, Middleton P, Cyna AM, Matthewson M, Jones L. Hypnosis for pain management during labour



- and childbirth. *Cochrane Database Syst Rev.* 2016; (5): CD009356.
- 19 Henry DE, Cheng YW, Shaffer BL, Kaimal AJ, Bianco K, Caughey AB. Perinatal outcomes in the setting of active phase arrest of labor. *Obstet Gynecol.* 2008; 112(5): 1109–1115.
 - 20 Anarado A, Ali E, Nwonu E, Chinweuba A, Ogbolu Y. Knowledge and willingness of prenatal women in Enugu Southeastern Nigeria to use in labour non-pharmacological pain reliefs. *Afr Health Sci.* 2015; 15(2): 568–575.
 - 21 Lothian JA. Lamaze breathing: what every pregnant woman needs to know. *J Perinat Educ.* 2011; 20(2): 118–120.
 - 22 Bankowski JB, Hearne AE. *John Hopkins gynecology and obstetric handbook.* Ankara: Atlas Kitapçılık. 2005.



Submission Guide

Journal of Integrative Medicine (JIM) is an international, peer-reviewed, PubMed-indexed journal, publishing papers on all aspects of integrative medicine, such as acupuncture and traditional Chinese medicine, Ayurvedic medicine, herbal medicine, homeopathy, nutrition, chiropractic, mind-body medicine, Taichi, Qigong, meditation, and any other modalities of complementary and alternative medicine (CAM). Article

types include reviews, systematic reviews and meta-analyses, randomized controlled and pragmatic trials, translational and patient-centered effectiveness outcome studies, case series and reports, clinical trial protocols, preclinical and basic science studies, papers on methodology and CAM history or education, editorials, global views, commentaries, short communications, book reviews, conference proceedings, and letters to the editor.

- No submission and page charges
- Quick decision and online first publication

For information on manuscript preparation and submission, please visit JIM website. Send your postal address by e-mail to jcim@163.com, we will send you a complimentary print issue upon receipt.