

# Is prenatal childbirth preparation effective in decreasing adverse maternal and neonatal response to labor? A nested case-control study

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**Abstract.** Sophrology, based on a combination of Western relaxation therapy and Eastern yoga and meditation might decrease maternal stress during labor. This study aimed to evaluate whether prenatal sophrologic childbirth preparation may decrease maternal and neonatal adverse response associated with delivery. In a nested case-control study, 69 nulliparous, singleton pregnant women who underwent an educational course of sophrologic childbirth preparation were compared to 69 nulliparous, singleton, age- and gestational age-matched pregnant women who did not receive any childbirth preparation. All babies were vaginally delivered. Groups were not different ( $P > 0.05$ ) in the number of neonates born with meconium-stained amniotic fluid as well as in the number of babies with Apgar score  $\leq 7$  at 1 and 5 minutes after birth. Duration of labor was not different between groups. The number of women requiring oxytocin and delivering babies with low pH blood levels tended to be lower in the group undergoing sophrologic childbirth preparation, i.e. 58.0% vs 72.5% ( $P = 0.07$ ) and 1.4% vs 10.9% ( $P = 0.06$ ), respectively. In conclusion, we were unable to confirm that prenatal sophrologic childbirth preparation has a definitive role in decreasing adverse maternal and fetal response to pain or in shortening labor. Prospective cohort studies with a larger sample size or randomized trials may help to clarify this gap. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** Childbirth preparation, perinatal outcome, sophrology

## Introduction

Severe pain during labor that is secondary to uterine contractions, cervix dilation and force exerted by the fetus throughout the birth canal, may result in systemic responses in the mother, including hyperventilation and respiratory alkalosis, which enhance oxygen consumption, cardiac output, systemic and peripheral resistances and blood pressure. These alterations may diminish uterine perfusion favoring metabolic acidemia in the fetus (1). Anxiety and physical exertion during labor may further aggravate such maternal and fetal adverse responses to pain and uterine contractions (1).

Some methods of prenatal childbirth preparation such as Lamaz (2, 3), sophrology (4), and respiratory autogenic training (5) have been developed in the attempt to decrease anxiety and physical exertion and to improve perinatal outcomes. Sophrology from the roots "sos" serenity and harmony, "phren" spirit and consciousness, and "logos" study or science, was originally invented by Alfonso Caycedo in 1966, and is based on a combination of Western relaxation therapy and Eastern yoga and meditation. It is considered to be useful in a wide range of conditions varying from exam preparation, building of self confidence, stress management, as a technique for breathing and relax-

ation, for improving the quality of sleeping, and as a form of anesthesia without medications by diminishing psychological tension through comforting and sympathetic words and corporal tension through muscle relaxation.

Besides these fantastic and some questionable claims on sophrology, this form of childbirth preparation has gained a good reputation in different countries and has been successfully used since 1997 at the Cheil Hospital & Women's Health Care Center in Korea. However, it is unknown whether this birth preparation may decrease maternal stress and associated fetal metabolic response to stress produced during labor. This study was therefore designed to evaluate whether prenatal sophrologic childbirth preparation can decrease adverse maternal and fetal response to pain in labor and if it can reduce the duration of labor.

## Methods

The study was approved by the Institutional Research & Ethics Board at Cheil Hospital & Women's Health Care Center, Seoul, Korea, and was performed in its Division of Maternal-Fetal Medicine. After a detailed explanation of the study, written informed consent was obtained from all participants.

In a nested case-control study design, 69 nulliparous, singleton pregnant women who agreed to participate in an educational course of sophrology were enrolled. As a control group, 69 nulliparous, singleton, age- and gestational age-matched pregnant women who did not take any educational course for childbirth preparation were also included in the study.

### *Prenatal sophrologic childbirth preparation*

Participants were trained with sophrologic techniques of relaxation for 2 h/week during 4 weeks, starting from the 32nd week of gestational age. The sophrologic method, also called dynamic relaxation, combined different exercises of oriental Yoga and Zen methods. The training in sophrology consisted of three steps. In the first step, pregnant women were trained on the simulating image of delivery process and to hear calm and regular words until the subject

reaches a relaxed state but without falling asleep (sophro-liminal state). In the second step, women are trained on deep inspiration and expiration respiratory exercises to be used during labor from the crown of the baby's head to childbirth. Finally, the third step consisted of sophrologic relaxation techniques that include the following Yoga exercises: relaxation under cross-legged and cat postures, muscle relaxation of abdomen to be used between uterine contractions, and exercises of perineal and perianal muscles.

### *Maternal outcomes*

The patients were constantly monitored by clinical and tocographic evaluations performed by the staff members of the Department of Obstetrics and Gynecology. The staff assisting the participants in the delivery room was unaware on whether the women had undergone sophrology or not. However, we were unable to mask the relaxation techniques used by the participants who had received sophrologic childbirth preparation during delivery. No case underwent amniotomy in order to avoid the risk of umbilical cord prolapse.

The following events were registered and analyzed for purpose of the study: a) Oxytocin administered at a dose level that did not exceed 30 drops/min of a solution containing 10 units of oxytocin in 1 L of dextrose if ineffective labor was suspected, b) Oxytocin administered after ripening the cervix with dinoprostone (a prostaglandin-E<sub>2</sub>) for labor induction, c) Meperidine 50 mg intramuscularly administered if women were not able to endure labor pain, d) Epidural analgesia administered if the pain was not properly controlled with meperidine, and e) Nasal administration of oxygen if the patient was hyperventilating.

### *Neonatal outcomes*

As adverse fetal response, the 1-min and 5-min Apgar scores, the pH blood level obtained from a blood sample drawn from the umbilical artery immediately after birth, and the presence of meconium-stained amniotic fluid, were registered. As previously described elsewhere (6), a pH < 7.2 of umbilical artery blood was used to define neonatal acidemia.

### Statistical analysis

Continuous variables were compared between the groups using the Student *t*-test, and categorical variables were compared with the Chi-square test or Fisher's exact test. A two-tailed  $P < 0.05$  was considered as the significant limit. Since there were no previously reported clinical trials evaluating the efficacy of sophrology for decreasing maternal or fetal complications, the sample size was conveniently established according to the number of pregnant women who were voluntarily enrolled into the sophrologic prenatal training.

### Results

All participants completed the study and were included in all the statistical analyses. All of them vaginally delivered a singleton baby that was born with vertex presentation without instrumental extraction. We did not observe any case of pregnancy-induced hypertension or gestational diabetes or any baby born with intrauterine growth restriction or major malformations.

Statistical differences were not observed in the maternal and fetal demographic characteristics between the control and sophrology group (Table 1). In the sophrology group, 51 (73.9%) women were admitted to the delivery room with labor pain occurring every 10 minutes or less, with complete cervical effacement, and cervix dilation of at least 2 cm. The other 18 (26%) women were admitted for labor induction

due to prolonged gestation or premature rupture of membranes. A similar number of patients required labor induction in the control group.

The number of women who underwent labor induction (26.1%) was identical in the two study groups (Table 2). The duration of labor was similar ( $P > 0.05$ ) between women undergoing prenatal childbirth preparation and controls. In the control group, 72.5% of women received oxytocin in comparison with 58% of women who underwent prenatal sophrologic preparation. However, this difference was not enough to reach a statistically significant difference between the groups ( $P = 0.07$ ). The number of patients who received demerol, epidural analgesia, or nasal administration of oxygen during labor was similar in the 2 study groups.

With reference to the neonatal outcomes (Table 2), we did not observe statistical differences between the groups in the number of neonates with meconium-stained amniotic fluid or in the number of babies with Apgar score  $\leq 7$  at 1 or 5 minutes after birth. Despite the fact that the incidence of fetal acidemia tended to be lower among babies born from mothers who had received sophrologic childbirth preparation than those born from controls, 1.4% vs 10.9%, respectively, we did not observe statistical differences between the groups ( $P = 0.06$ ). Only one baby born in the control group showed a pH  $< 7.0$ . However, a satisfactory postpartum evolution was observed in all babies without requiring any special or critical care.

### Discussion

This study appears to be the first comparison of maternal and fetal response to pain in labor as well as of the duration of labor between women undergoing prenatal sophrologic preparation and controls. We observed an increase of 15% in women requiring oxytocin for uterine stimulation and a greater number of babies that were born with acidemia (7 times higher) in the control group compared to women undergoing prenatal sophrologic preparation.

More than two decades ago, it was observed that sophrology significantly reduced the rate of women requiring general anesthesia for induced abortion (7). The method seems to allow the mother to obtain a

**Table 1.** Maternal and fetal characteristics

| Demographic characteristics         | Sophrology group<br>(n = 69) | Control group<br>(n = 69) |
|-------------------------------------|------------------------------|---------------------------|
| Age at enrollment (years)           | 29.6 $\pm$ 0.3               | 28.8 $\pm$ 0.4            |
| Previous pregnancies (n)            | 1.4 $\pm$ 0.1                | 1.4 $\pm$ 0.1             |
| No. of visits for prenatal care     | 12.5 $\pm$ 0.3               | 11.7 $\pm$ 0.4            |
| Maternal BMI at enrollment          | 24.8 $\pm$ 0.3               | 25.2 $\pm$ 0.4            |
| Gestational age at delivery (weeks) | 39.4 $\pm$ 0.9               | 39.5 $\pm$ 0.9            |
| Fetal weight (kg)                   | 3.3 $\pm$ 0.01               | 3.3 $\pm$ 0.01            |
| Newborn BMI                         | 14.5 $\pm$ 0.1               | 13.3 $\pm$ 0.2            |

Data were summarized as mean  $\pm$  SD. No statistical differences ( $P > 0.05$ ) were observed between groups in any of these parameters

**Table 2.** Maternal and neonatal outcomes

|   | Sophrology group<br>(n = 69) | Control group<br>(n = 69) | <i>P</i> value |
|---|------------------------------|---------------------------|----------------|
| <i>Women undergoing spontaneous labor</i> (n) | 51 (73.9)                    | 51 (73.9)                 | —              |
| Duration of labor (min)                       | 523 ± 402                    | 572 ± 457                 | 0.6            |
| <i>Women undergoing labor induction</i> (n)   | 18 (26.1)                    | 18 (26.1)                 | —              |
| Duration of labor (min)                       | 1,441 ± 613                  | 1,471 ± 580               | 0.9            |
| <i>Maternal intrapartum administration of</i> |                              |                           |                |
| Oxytocin                                      | 40 (58.0)                    | 50 (72.5)                 | 0.07           |
| Demerol                                       | 42 (60.9)                    | 44 (63.8)                 | 0.7            |
| Epidural analgesia                            | 8 (11.6)                     | 5 (7.2)                   | 0.4            |
| Oxygen (nasal administration)                 | 40 (58.0)                    | 48 (69.6)                 | 0.2            |
| <i>Neonatal outcomes</i>                      |                              |                           |                |
| Meconium-stained amniotic fluid               | 7 (10.1)                     | 11 (15.9)                 | 0.3            |
| 1 min-Apgar score ≤ 7                         | 2 (2.9)                      | 5 (7.2)                   | 0.4            |
| 5 min-Apgar score ≤ 7                         | -                            | 2 (1.4)                   | 0.5            |
| Acidemia*                                     | 1 (1.4)                      | 7 (10.9)                  | 0.06           |

\* Acidemia: pH < 7.2 in blood from umbilical artery obtained within the 1<sup>st</sup> minute after birth.

Data were summarized as n (%) or mean ± SD

stabilized mind and body through both mental and physical training. The basic concept of sophrologic childbirth preparation is supported by the acceptance of natural labor and delivery which is known as “sophro-acceptance”. The sophrologic point of view of labor is different from other traditional ideas. Both Lead and Lamaze methods try to obtain an alleviating effect by shutting-off the pain related to labor (8, 9). In contrast, during the prenatal sophrologic preparation, labor pain is considered as the most indispensable energy in the process of delivering a baby. This is the reason why this method has been called an over-pain delivery. However, pregnant women should also realize that the delivery process is a fulfilling part of a woman’s life linking pregnancy, childbirth and infant rearing (<http://www.infobears.ne.jp/sophrojm/sophro-001-e.html>). However, a systematic review on pain and maternal satisfaction with the experience of childbirth showed that personal expectations, amount of support from caregivers, quality of the caregiver-patient relationship, and patient’s involvement in decision making may override the influences of other factors including prenatal childbirth preparation (10).

In this study, the rate of patients requiring epidural analgesia during labor as well as the duration of labor in women undergoing childbirth preparation and in controls were not significantly different

( $P > 0.05$ ). A previous study reported that relaxation by means of hypnotherapy in labor decreased the duration of labor and the use of analgesic agents in a large group of pregnant women in comparison with control women (11). However, the Lamaze relaxation technique was not able to decrease distress during labor or the duration of labor (12). The lack of efficacy was attributed to the failure of mothers in using this technique during labor.

In our study, two major outcomes which include the number of women requiring oxytocin for ineffective labor and the number of babies born with acidemia, were substantially lower in the sophrology group. However, the significant limit was not reached. According to our study, a sample size of approximately 120 women in each study group would be required in order to detect statistical differences in the incidence of babies born with acidemia (assuming that the rates observed in our study are maintained with an alpha and beta power of 0.05 and 0.8, respectively).

The pH of umbilical artery blood is representative of the fetal metabolic conditions (13). The umbilical artery pH levels in the neonates and oxytocin administration may be related. Hypoxia produced during uterine contractions may favor meconium-stained neonates (14), and oxytocin may favor fetal intrapartum hypoxia by increasing uterine contractions in a

dose-dependent manner (15). However, the biological mechanism of how prenatal sophrologic preparation may prevent oxytocin administration could not be explained by our results and even a theoretical mechanism of this clinical relationship would be difficult to propose with the scientific information currently available in this field.

Approximately 40% of pregnant women may have fear of pain (16). Motivated by such fears, it would be interesting to know if the participants in either the control or experimental group had any informal childbirth education, such as reading. Knowledge gained by pregnant women in this way may potentially influence their response to stress and alter physiological responses during labor. Finally, it is also probable that the lack of differences in maternal and neonatal outcomes between the sophrology and control groups was a true negative result. In this case, sophrology may act as a biologically ineffective placebo although the psychological benefits and women's attitude in accepting vaginal delivery should be explored in future studies.

In conclusion, although prenatal sophrologic preparation may contribute to decreasing perinatal complications, in this prospective cohort study with nested cases and controls, we were unable to confirm that primiparous, singleton women receiving sophrologic childbirth preparation have better maternal and fetal outcomes than age- and gestation age-matched primiparous, singleton, control women. Studies with a larger sample size or randomized control trials may help to clarify our findings.

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