

The Effect of Normal Physiologic Childbirth on Labor Pain Relief: an Interventional Study in Mother-Friendly Hospitals

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ABSTRACT

Introduction: Normal physiologic childbirth program was implemented in mother-friendly hospitals of Iran after 2008. In normal physiologic childbirth, non-pharmacological methods of labor pain relief were applied. The aim of the present study is to assess the effect of the normal physiologic childbirth program in a mother-friendly hospital on labor pain relief.

Methods: This study was a clinical trial that was conducted in Sina mother-friendly hospital in Ahvaz, Iran, in 2016. The intervention group of 57 women was offered childbirth preparation classes during pregnancy and a normal physiologic childbirth program during labor, while the control group of 57 women received conventional care. The study outcome was the amount of labor pain measured between contractions in various cervical dilatations until delivery.

Results: In the cervical dilatations of 6 cm, 8 cm and 10 cm, labor pain in the intervention group was significantly lower than the control group. Furthermore, the mean of labor pain in the intervention group was significantly lower than the control group ($p < 0.001$)

Conclusion: Complete implementation of the normal physiologic childbirth program can reduce the severity of labor pain.

Keywords: natural childbirth; prenatal education; labor pain; pain management; non-pharmacologic approaches.

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INTRODUCTION

Childbirth is as old as the man that brings unique experiences for women that will always be with them throughout their lives (1). Childbirth experience has been influenced by many factors such as knowledge about the labor process, quality of care and services, severity of labor pain, method of labor pain management and medical interventions. Medical interventions that result from the advancement of medical science and seek to ensure the safety of childbirth sometimes eliminate the concept of labor as a physiologic phenomenon and look to it as a medical problem (2, 3). One of the main results of the medical treatment approach to childbirth is the wasteful increase in cesarean section (C/S). According to the World Health Organization, the C/S rate should not exceed 10-15% of all births in any part of the world (4), but published statistics in many countries, especially in Iran, differed from this ratio and are very high (5). C/S is a major operation that has complications such as maternal death (6), hemorrhage (7), infection (8), need for blood transfusion (9), dense internal adhesions (10), thromboembolic (6), urinary retention (11), bladder injury (12), and anesthetic complications (13, 14). Furthermore, a growth in the C/S rate in a country may cause high costs to the national health system (5).

Women's fear of labor pain is known as one of the reasons for increasing the rate of C/S (15, 16). Labor pain is a physiologic phenomenon, but the psychosocial issues connected with it can harm women. It has consequences such as stress symptoms, regret for the vaginal birth decision and a request for C/S (17, 18). Management of labor pain is a serious aspect of obstetric care and a main goal of childbirth-related care (19).

In response to a wasteful increase in C/S rates, the Coalition for Improving Maternity Services in the United States recorded its first agreement to improve vaginal delivery. In this way, the term "mother-friendly hospital" was launched in 1996 (20). The objectives of mother-friendly hospitals included improving the quality of normal childbirth care, reducing costs, and paying attention to the rights of mother and neonate (21). The principles of these hospitals include the natural process of delivery, mother's empowerment,

freedom of action and independence, interventions based on specific indications, and not routine (20).

In Iran, in the second half of 2002, the Mothers Health Department of the Ministry of Health and Medical Education began designing the content of mother-friendly hospital's services. In this plan, the construction of new hospitals is not considered, but modification of the workflow and change in the content of services in the existing parts of maternities are considered. In the design of a part of the mother-friendly hospital's program, a primary protocol for standards of normal delivery using non-pharmacological pain relief techniques (**normal physiologic childbirth**) has been developed. After careful and scientific review and final corrections, this protocol was performed in a few hospitals in Iran after 2008 (22, 23).

According to the principles of mother-friendly hospitals of Iran, in a comprehensive view, the normal physiologic childbirth program does not include only the labor and childbirth periods, but it begins during pregnancy with the preparation of the pregnant woman and her companion in the childbirth preparation classes. Preparation classes start at the beginning of the 20th week of pregnancy and include eight sessions. The checklist of each meeting is based on the booklet of Ministry of Health, Medicine and Medical Education. Some of these topics include teaching of anatomy and physiology related to pregnancy, risk symptoms, nutrition, personal and mental health, embryo development, supportive techniques, role of care givers, choice of delivery method, mothers' responsibilities for self-care, high-risk childbirth and mother's participation, preparation of parents, visit to the maternity ward and familiarity with health care providers.

At the time of delivery, the absence of unnecessary medical interventions in the natural course of labor, individual support of women by a reliable person, freedom of movement in labor, non-supine positions, skin contact of the newborn and mother quickly after delivery and breast feeding are recommended. In physiologic childbirth, specific emphasis is put on the management of labor using a variety of non-pharmacological pain relief techniques such as aromatherapy, heat therapy, acupressure, birthing ball, water therapy, music therapy, reflexology, relaxation, respiratory techniques, etc. As indicated by

the suggestions of Iran's Ministry of Health and treatment, a mix of non-pharmacological techniques is usually used according to women's will and satisfaction (22, 23).

The present investigation evaluated the impact of normal physiologic childbirth program in a mother-friendly hospital on labor pain relief. ■

METHODS

This was an interventional study with a protocol approved by the Ethics Committee of Mashhad University of Medical Sciences, Mashhad, Iran, and it was registered within the Iranian registry of clinical trials (<http://irct.ir>) IRCT No. IRCT201508132204N4. The study was carried out at Sina mother-friendly hospital in Ahvaz, Iran, in 2016. A pilot study was conducted to calculate the sample size, which recommended that a sample of 57 women within each group would provide a power of 95% at 5% significance. Subjects were selected from the prenatal clinic of our hospital after informing them on the aim and course of the investigation and after obtaining their written consent during the primary half visits of pregnancy. Selection of participants was purposive. It should be noted that the matching strategy was used to control external factors; thus, for each subject in the intervention group, a single subject was selected for the control group for important external variables. Women who were happy with their participation in the labor planning classes were included in the intervention group, and those who did not agree to attend classes and just got standard routine care were included in the control group. *Inclusion criteria* were as follows: consent to participate in the study, age of 18 to 35, low risk pregnancy, single fetus, lack of contraindications for vaginal birth, estimation of fetal body weight of 2.5 to 4 kg, participation in antenatal readiness courses for the subjects in the intervention group, 3 to 4 cm of cervical dilation at the beginning of the study, and presence of a trained companion in labor unit for the intervention group. *Exclusion criteria* were as follows: presence of risk factors at any time of the childbirth process, such as severe vaginal bleeding, pathologic deceleration in the fetal heart rate, unnecessary and routine medical interventions such as use of some pharmacological agents (eg, atropine for

acceleration of labor), induction of labor and use of fundal pressure.

The intervention was a complete execution of the physiologic delivery program, which included holding antenatal preparation courses and physiologic childbirth utilizing a mix of non-pharmacological pain relief strategies.

Antenatal preparation courses, attended by pregnant mothers and their female companions, were started at the beginning of the 20th week of pregnancy in eight sessions over a period of ninety minutes per session, in a standard classroom in the center. The teacher was a trained midwife with a valid certification of prenatal education approved by the Ministry of Health. The educational content of every session was according to the standard booklet of Iran's Ministry of Health and Treatment. At the end of the course, each person was given a certificate of attendance.

In the normal physiologic childbirth program, at the time of labor women were permitted to eat liquid foods such as water, fresh fruit juices, soups, porridges, and also dates. Routine medical interventions such as amniotomy, labor induction, serum therapy, and urinary catheterization were not performed. Complete bed rest was not required, and women were allowed to be in any agreeable position. A trained female companion was present alongside each woman until delivery.

In the active phase of labor, a mix of non-medical pain relief techniques, including utilizing a birthing ball, warm water Jet and aromatherapy with lavender oil, were utilized. The water Jet was filled with warm water with the temperature of 36 to 39° C, so that the surface of the water was on the abdomen and under the client's breasts. The participants were in a half-sitting position. The water Jet was used from the start of the active phase of labor and at least one hour was essential. Besides, during the active phase of labor, mothers were sitting on a birthing ball for 30 minutes and moving the pelvis right and left or back and forward. Toward the start of the active phase of labor until delivery, aromatherapy was carried out using 15×15 cm napkins impregnated with 0.1 cc of 3% Lavender essential oil combined with one cc of sterile water, which were fitted on each woman's neckline.

Vaginal examinations were done every two hours, and fetal heart rates were estimated each half-hour in the active phase. In the second stage of labor, vaginal examinations were done every half-hour, and the fetal heart rates were estimated at regular intervals. The progress of labor of all women was plotted on the partograph form.

Upon completion of cervical dilation, a couple of minutes before delivery, subjects were transmitted to the specific bed of normal physiologic childbirth and were set in an upright position and simultaneously with uterine contractions and a feeling of defecation, encouraged to pushing. Episiotomy was not routine. Immediately after the expulsion of the fetus, ten units of intramuscular oxytocin were injected to the mother. Immediately after delivery, skin contact of the mother and the neonate and breast feeding were performed with the help of the responsible neonatal staff. After two hours of birth, mothers were transmitted to the postpartum ward. It should be noted that all women who had a risk factor requiring medical intervention at any time of the study were excluded from the study.

Subjects of the control group received routine standard care. Mothers' companions were not allowed to enter the labor room. Complete bed rest was a part of the routine. Vaginal examination and fetal heart auscultations were similar to those carried out in the intervention group. At the time of delivery, mothers were set in lithotomy position. At this stage, using the Valsalva maneuver, the mothers were asked to push. The modified Ritgen maneuver was used to exit the

fetus. Immediately after expulsion of the fetus, 20 units of oxytocin were infused intravenously, and the neonate was placed under a radiant heater.

It ought to be noted that to prevent bias, every intervention was done by midwives with a 5-10 years history of working at maternity. They attended in both physiologic and conventional delivery wards of the hospital.

The data-collection instrument was a self-made questionnaire that was validated through content validity, and its reliability has been affirmed with $r=0.92$. This form comprised two sections: the first one related to the demographic characteristics of the samples, and the second one related to pregnancy and labor information. The study outcome was the amount of labor pain measured by the investigator between contractions in various cervical dilations until delivery. The Visual Analog Scale was used to estimate labor pain which was a 100 mm line with 90° angles at each end. Bipolar anchors (painless and pain in the worst possible way) are placed at each end of the line (24). Participants were asked to display a mark along the length of the line to show their pain intensity. Then, the distance between the left end of the line (painless anchor) and the markings given by the participants was measured using a ruler. This amount indicates the severity of the pain.

Data analysis was performed in SPSS Ver. 11.0 at a confidence interval of 95%. The Kolmogorov-Smirnov test, descriptive statistics, independent t-test, repeated measures test, Bonferoni post hoc test, and chi-square were used. □

RESULTS

Participants' flow through the study is shown in Figure 1. Table 1 shows basic data of both study groups including demographic data and qualitative features of pregnancy and labor. There was no significant difference in quantitative features of pregnancy and childbirth between the intervention and control groups (Table 2).

There was no significant difference between study groups in pain score at the beginning of the study. Independent t-test showed that in the cervical dilatations of 6 cm, 8 cm and 10 cm, the labor pain score in the control group was signifi-

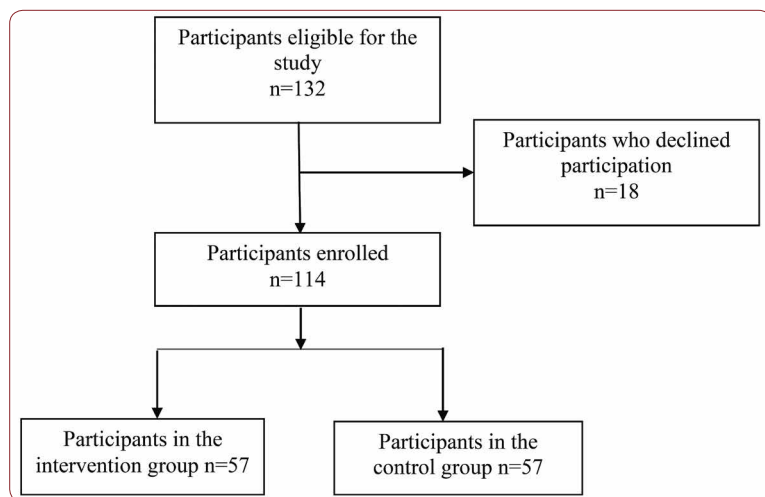


FIGURE 1. The flow of participants through the study

Parameter		Baseline	Peak CM	CM washout	p value (ANOVA)
Age		<20 years	9 (15.78)	7 (12.28)	0.56
		20-24 years	15 (26.31)	22 (38.59)	
		25-30 years	21 (36.84)	17 (29.82)	
		>30 years	12 (21.05)	11 (19.29)	
Education level		Primary school	33 (57.89)	30 (52.63)	0.87
		High school	15 (26.31)	19 (33.33)	
		College degree	9 (15.78)	8 (14.03)	
E/A ratio		Housekeeper	52 (91.22)	52 (91.22)	1.0
E/A ratio		Beautifier	4 (7.01)	5 (8.77)	
E/A ratio		Photographer	1 (1.75)	0 (0)	
E/A ratio		Primiparous	37 (64.91)	35 (61.40)	0.42
E/A ratio		Multiparous	20 (35.08)	22 (38.59)	
E/A ratio		<18.5	10 (17.54)	7 (12.28)	0.39
E/A ratio		18.5-24.9	28 (49.12)	34 (59.64)	
E/A ratio		25-29.9	9 (15.78)	11 (19.29)	
E/A ratio		>30	10 (17.54)	5 (8.77)	
Fetal membranes at admission		Intact	35 (61.40)	37 (64.91)	0.69
		Rupture	22 (38.59)	20 (35.08)	
Uterine contractions at the beginning of the study	Numbers in 10 min	3	14 (24.56)	15 (26.31)	0.71
		4	23 (40.35)	26 (45.61)	
		5	20 (35.08)	16 (28.07)	
	Severity	Moderate	35 (61.40)	33 (57.89)	0.70
		Severe	22 (38.59)	24 (42.11)	
Delivery mode		Vaginal delivery	52 (91.23)	51 (89.47)	0.66
		C/S	5 (8.77)	6 (10.53)	
Sex of neonate		Female	30 (57.69)	27 (52.94)	0.62
		Male	22 (42.31)	24 (47.05)	
First min APGAR		7	2 (3.84)	1 (1.96)	0.81
		8	8 (15.38)	7 (13.72)	
		10	48 (92.31)	50 (98.94)	
5 min APGAR		9	4 (7.69)	1 (1.96)	0.18
			10.10 ± 3.58	9.70 ± 2.80	

*Data are shown as numbers (percent)

TABLE 1. Demographic data and qualitative characteristics related to pregnancy and labor of the two study groups*

cantly higher than the intervention group (Table 3).

Based on the repeated measures test, the mean of labor pain in frequent measurements showed a significant difference ($p=0.008$). As well, the mean labor pain in the intervention group was significantly lower than the control ($p<0.001$) (Table 4). Comparison of the pair to pair of the mean of labor pain using Bonferoni

post hoc test demonstrated that there is a significant difference between all of the pairs to pairs. □

DISCUSSION

The aim of this study was to evaluate the impacts of the normal physiologic childbirth program on labor pain. The results demonstrated a statistically significant decrease in labor pain

	Intervention group (n=57)	Control group (n=57)	P value
Gestational age (days)	275.61±8.06	272.88±9.03	0.09
Weight gain in pregnancy (kg)	11.82±4.53	13.40±4.81	0.07
Uterine contraction duration at beginning of study (sec)	45.52±8.32	43.77±7.27	0.23
BISHOP score	6.47±1.33	6.12±1.15	0.13
Baseline cervical dilatation (cm)	4.07±0.77	3.92±0.70	0.31
Baseline cervical effacement (%)	51.57±12.78	47.36±14.45	0.10
Neonate's weight (gr)	3346.01±441.85	3274.49±394.38	0.39
Neonate's head circumference (cm)	34.24±1.23	34.34±0.92	0.63
First min APGAR	8.78±0.51	8.82±0.43	0.56
5 min APGAR	9.92±0.26	9.98±0.14	0.17
*Data are shown as the mean ± standard deviation			

TABLE 2. Quantitative characteristics related to pregnancy and labor of the two study groups*

	Intervention group (n=57)	Control group (n=57)	P value
At beginning of the study	6.70±1.73	7.31±2.11	0.09
At cervical dilatation of 6cm	8.29±1.74	9.27±1.13	0.001
At cervical dilatation of 8cm	9.14±1.05	9.67±0.87	0.005
At cervical dilatation of 10cm	9.73±0.62	9.96±0.28	0.019
*Data are shown as the mean ± standard deviation			

TABLE 3. Comparison of the mean of labor pain in different cervical dilatations in two study groups*

	f	df	P value
Greenhouse-Geisser	1.96	4.54	0.01
Huynh-Feldt	2.30	4.54	0.008
Group	1	14.82	<0.001

TABLE 4. Comparison of the mean of labor pain in two study groups using repeated measures test

when the normal physiologic childbirth program was completely executed.

In mother-friendly hospitals of Iran, the initial segment of the physiologic childbirth program is holding labor readiness classes for expectant women. In the present investigation, because of participation in these classes and visit to the maternity ward amid pregnancy, the members of the intervention group were rationally arranged for confronting the phenomenon of childbirth. Antenatal training is in a powerful position to enhance normal delivery. A review by Ferguson *et al.* has shown some positive emotional impacts of antenatal training on labor and delivery. One of these impacts is a decrement in maternal tension (25).

Fear of vaginal delivery, anxiety, tension, and unfamiliarity with the environment bring sentiments of profound insecurity for women during labor, recognizing a solid connection among labor pain and anxiety in laboring women (26-28).

It seems that each of the non-pharmacological approaches of labor pain relief that were applied in the present investigation could relieve labor pain, and when these combined with each other, the analgesic effects were intensified too.

Rush's study showed that using a Jacuzzi in labor had positive effects on analgesia requirements (29). A Cochrane review revealed that immersion in water during the primary stage of labor decreases the utilization of epidural or spinal analgesia (30). It seems that a relative condition

of weightlessness in water enables the laboring women to take different positions that are soothing and agreeable. Furthermore, immersing in warm water can create a calming impact which can relieve anxiety. Also, water immersion can reduce the secretion of stress-related hormones such as catecholamines (31, 32).

A recent meta-analysis suggested that the clinical use of a birthing ball exercises could be an useful tool for parturient women to decrease pain (33). The basic mechanism of a birth ball remains unknown but according to the gate control theory, using non-painful massages to a painful area can reduce pain (34). Furthermore, the birth ball may provide a perineal support without imposing huge pressure (35).

Also, some investigations showed that freedom of movement and upright positions during labor helped the natural power of gravity to improve the presenting part descent, enhancing the quality and adequacy of uterine contractions and reducing the labor pain (36, 37).

A recent meta-analysis by Makvandi *et al.* demonstrated a decrease in labor pain with Lavender aromatherapy via both massage and inhalation (38). It seems that there is a close connection among maternal anxiety and severity of labor pain, Lavender oil as a basic oil, is consumed via breathing and can decrease cortisol secretion or increase serotonin secretion. Mirzaei's study showed that aromatherapy with Lavender oil decreased the rate of maternal anxiety, cortisol release, and improved serotonin discharge during labor (39, 40).

In addition to the above mentioned study, the reduction in labor pain that happens with

non-pharmacological strategies of labor pain relief may be associated to distraction from the feeling of pain (41).

One of the limitations of this study was that randomization of subjects was not possible. The normal physiologic childbirth was an emerging phenomenon in Iran and was moderately obscure to pregnant women. Since one of the standards of the normal physiologic childbirth program is to give decision-making power to females, we cannot compel pregnant women to have a normal physiologic delivery or conventional delivery. In other words, in mother-friendly hospitals, the majority of clients were recommended to participate in childbirth preparation classes and deliver physiologically; however, the decision was entirely made by participants. So, we needed to use purposeful sampling. But the utilization of matching strategy controlled the external factors. □

CONCLUSION

The results of this investigation demonstrated that completion of the physiologic childbirth program could decrease the severity of labor pain. Therefore, it supports the usefulness of policies that enable all pregnant women to participate in this program and benefit from it. □

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