

Comparative study on the influence of three delivery positions on pain intensity during the second stage of labor

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ABSTRACT

Background: Labor is a physiologic process, and consideration of labor pain and relieving that is among the major components of maternal care. Application of some labor position can lay the fetus better in pelvic canal direction. The present study aimed to investigate the effect of laying the mother in three labor positions on the pain severity in the second, third, and fourth stages of labor.

Materials and Methods: This is a clinical trial conducted on 96 primiparous pregnant women randomly selected through convenient sampling from those who were hospitalized in the hospitals of Isfahan and Jahrom. Women with a gestational age of 37–42 weeks, singleton pregnancy, who had passed the first labor stage through physiologic process, and with cephalic presentation were selected. The subjects were randomly allocated to be in the groups of lithotomy, sitting, and squatting positions. Pain severity in the second, third, and fourth labor stages was measured with visual analog scale (VAS) as well as McGill present pain intensity (PPI). The data were collected through interviews and observations with the help of VAS. The data were analyzed by Chi-square and Kruskal–Wallis statistical tests.

Results: In the latent phase of the second labor stage, mean pain severity in lithotomy (2.27) and squatting positions (2.48) was significantly less than the mean pain severity in sitting (5.33) position ($P = 0.001$). Pain severity in the active phase of the second and third labor stages was significantly less in squatting position (6.14) group compared to the other two groups (7.59 and 7.41 in sitting and lithotomy positions, respectively) ($P = 0.024$). Pain severity in the fourth labor stage showed no significant difference in all three groups.

Conclusions: Application of various labor positions as one of the non-medication methods to reduce pain in the second and third stages of labor leads to labor pain reduction.

Key words: Childbirth pain, delivery position, labor positions, McGill numerical scale and verbal scale, pain delivery, second labor stage, the second stage of delivery

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INTRODUCTION

The main goal of human development is to serve humans and breed their capabilities, abilities, and talents.

Previous studies have shown that 65% of each country's wealth is its human resources. Women in the position of

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an efficient member of human resources and families can act as the greatest source of support, peace, and love for their family members. Personal and social identities of women grow before their other identities and are more constant. One of the indexes in the growth of personal and social identities is women's empowerment in various fields with the principle of paying attention to their physical and mental health.^[1] Women's health is under the influence of biological, social, economic, cultural, and bioenvironmental factors, and is affected by their fertility and motherhood role, especially in the age of 15–45 years (22% of the population in Iran). Women's health during this period is effective on family members' and children's long-term health.^[2] Provision of maternal physical and mental health is one of the goals in the third millennium with the components of safe pregnancy and delivery. Delivery has acute mental, social, and emotional effects on the mother and the family. Therefore, management of delivery stages plays a major role in the trend of health in about two-thirds of society members (women and children).^[3] As labor pain is among the most acute reported pains in humans,^[4] consideration of labor pain and its relief is an important component of maternal care in labor, such that it has been long suggested as one of the most important issues in midwifery.^[5] Labor pain is transferred by the stimulation of L₁–L₁₀ nerves at the first stage and, in addition to these, S₂–S₄ nerves at the second stage. This pain is relieved by various ways, which are divided into two major groups of medicational and non-medicational methods.^[6] Nowadays, non-medicational method of pain relief has been vastly applied as a safe method all over the world, and is based on mother's empowerment, reduction of their fear and anxiety, as well as increasing the family's and spouse's support leading to infant's benefit. These methods include stretching exercises and relaxation and breathing techniques. The collection of these skills is named as Lamaz, Bradley, and Dicreed, which result in reduction of pregnant mothers' fear and anxiety. In this direction, touch, energy therapy, and massage of hands, waist, and hips by the accompanying person, which can noticeably affect pain reduction, are emphasized.^[7] Aromatherapy through usage of scented oils such as rose, chamomile, and pennyroyal can be administered in combination with massage.^[8] Another way to lower pain is electrical stimulation of the nerves through skin or TENS in which the pain is lowered through sending signals at the time of contraction.^[9] Music therapy, hypnotism (artificial sleep),^[10] biofeedback technique, usage of heat and cold therapy, hydrotherapy, reflexology, acupuncture, and acupressure are among the other methods to lower pain.^[11] Laying in different positions at the time of labor pain, as one of the non-medicational methods, has been suggested as another way to reduce pain.^[7] The size of pelvis (diameters of labor canal) is affected by mother's position. In other

words, mothers' position affects the dimensions of their pelvis.^[12] Changes in mothers' position cause changes in pelvis spatial shape and lead to better adaptation of fetus axis with the labor canal. Most of the times, when the fetus is fitted by mother's pelvis, less pain is felt.^[13] Various positions at the time of labor and delivery which are categorized into six general groups bring about similar physical changes, and they are as follows:

- Semi-Fowler's and side lying positions cause comfort and convenience for mothers and neutralize spontaneous pushing with helping. These positions result in preserving the energy, especially when the women have stood up or walked for a long time^[14]
- Standing position which reinforces spontaneous pushing with helping lays fetus presentation behind the cervix, makes the quality of uterine contractions better, and results in quicker fetal head descend
- Forward bending positions lower the pain and enhance fetal rotation^[15]
- Exaggerated lithotomy position is applied during several contractions when the fetal head is trapped behind symphysis pubis. Supine position lowers the blood pressure, makes more low back pain felt, causes more painful contractions with higher frequency, and delays labor progress.^[9] Some studies have shown that mothers find standing position more comfortable.

In some other studies, supine position was desired by the mothers. Flynn *et al.* reported shortening of labor length and reduction of labor pain while mothers' walking and position changes.^[16] Calvert *et al.* stated that pain severity in primiparous mothers who walked during labor stages was more than in those who had lain down in bed.^[17] In Nasir *et al.*'s study, two positions of standing and lithotomy (lain down on back) were compared and it was reported that lithotomy position is appropriate for pushing as it imposes pressure on the posterior side of vagina.^[18] Hodnett *et al.* reported that labor in semi-Fowler position resulted in shorter length of labor in the second stage and less injury to perineum.^[19] Shorten *et al.* reported that being in a squatting position lowers intact perineum up to 42%.^[20]

In spite of the vast researches carried out in non-medicational methods to reduce pain and on labor positions, pain relief methods and their efficiency are controversial. In addition, in recent decades, invasive interventions in the management of delivery have been increased by technological advances, and simple protocol of natural labor has been influenced by invasive interventional systems, leaving the mother and the fetus at high risk, so that women cannot have non-interventional delivery and enough assurance and self-confidence.

The time the health providers and midwives spend on application of technology is more than the time they can spend on mothers' peace and comfort. So, physiologic childbirth and its benefits are forgotten.^[14] There are six golden standards in normal physiologic birth, which are evidence-based care that result in preservation and support of natural delivery and increase its chance as much as possible. These six standards include labor simultaneous beginning, continuation of physical and mental support in labor, stopping routine interventions, mothers' freedom for movement during labor, spontaneous pushing with helping, and prevention of mother-infant separation to gain the chance of first breast feeding after birth.^[2] Generally, the role of health providers is important not only to provide maternal care but also to supervise the childbirth to be as comfortable and complication free as possible.^[21] As in most of the hospitals, mothers' position at the admission and entrance to labor room is bed rest regardless of their desire, and the movements are more restricted by the ending part of the second stage, the mothers are deprived from the possible benefits of position change despite the existing controversy in the clinical meaning of cervix complete dilatation. In North America, description of the second stage of delivery is based on quick delivery.

In England, complete cervix dilatation is not regarded as important as in US and the second delivery stage goes on based on expulsion when intentional pushing starts for the first time. This approach has physiologic bases. The second delivery stage is divided into two phases: Latent and active phases. The latent phase is the phase of stability and peace, in which the uterine activity seems to reduce in complete dilatation, and is called as the stage of thanks giving or uterine rest. In North America, sometimes, it is wrongly considered as delivery second stage pacing down and in return, some interventions are conducted to speed that up.^[11] If the stage of stability and peace lasts more than 20–50 min, interventions are conducted to speed up delivery.

These interventions can be in the form of mothers' position change, administration of correct breathing, and encouragement of strain toward birth canal.^[22] The active phase of delivery second stage is defined by unintentional pushing and fetal descend. Sometimes, it is named as the pelvis labor part, pressure period, or descend. Various factors interfere with this stage, including uterine contractions, intentional struggle to exit the fetus, and mothers' laying position.^[11] Based on the above reasons, the second stage of delivery is considered as a very critical stage in which pain severity increases, and pain relief medications are limited due to their side effects on the fetus. Therefore, application of different childbirth positions may relieve

pain and bring about a positive delivery experience for the mother and the infant. In this way, long-term family health is provided through an emotional relationship between the mother and the infant. Nowadays, a healthy pregnancy and physiologic delivery with the least amount of interventions, in addition to supporting the mothers in physical and mental dimensions as well as reduction of cesarean section (C/S) cases are among the goals of Iranian Ministry of Health and Medical Education and international organizations. On the other hand, with the researcher's several years of work experience in labor room, she concluded that a high percentage of C/S cases are due to the interventions used to speed up the delivery and lack of diagnosing the latent phase of the second delivery stage. In addition, one of the reasons for high number of C/S cases in Iran is the role of midwives fading. Mothers' need for mental and physical support, as well as their encouragement to position change in the second stage of delivery by midwives play a major role in shortening this stage, leading to lower cases of C/S due to their low cost efficacy and simplicity.

Therefore, the researcher decided to investigate and compare the severity of delivery pain through different childbirth positions in the second stage of delivery.

MATERIALS AND METHODS

This is a clinical trial conducted on the primiparous women referring to Shahid Beheshti Hospital affiliated to Isfahan University of Medical Sciences and Ostad Motahari and Paymanieh hospitals affiliated to Jahrom University of Medical Sciences in 2010–2011.

The study inclusion criteria were: Primiparous women with gestational age between 37 and 42 complete weeks (gestational age based on the first day of menstruation and sonography of the first trimester), singleton pregnancy, fetal head presentation, passing the first stage of delivery physiologically, lack of any problems during physiologic delivery, and having dilatation of 8 cm.

The exclusion criteria were: Mothers who had fetal abnormal patterns of pulse in the first stage of delivery, estimated fetal weight of 4000 g (based on Johnson formula) and with acynclitism, no progress in delivery in the first stage of labor as determined by use of partograph form, a tear in the bag of water for over 12 h (if the amniotic sac had been torn before labor contractions), mother's tiredness at the end of the first labor stage, suffering from special diseases such as cardiac and respiratory diseases or systemic lupus erythematosus, no lower limb varices and hemorrhoid, no symphysis pubis dysfunction, joint problems in legs, such as rheumatoid arthritis, weakness in legs, mental and

neurologic disorders like psychosis and schizophrenia, anatomical and skeletal disorders, short perinea (the distance between vagina and anus <3.5 cm), blockage of sensory and motor nerves followed by epidural anesthesia, and prescription of oxytocin. Next, 96 qualified women were randomly selected and explained about the type of study, and finally, a written consent was taken from them. The subjects were divided into three 32-subject groups of lithotomy, squatting, and sitting positions and were lain in the related position by dilatation of 10 cm and effacement of 100% and asked to remain in that position until the complete exit of placenta.

Position of lithotomy in the present study was in such a way that the mother was in supine position with 30° head elevation and bent knees.

Sitting position was a position in which the mother sat on the labor chair in such a way that her lumbar spines were completely straight and the hip and knee joints were at the same level. In the squatting position, the mother was sitting on her feet so that her sole was in touch with the floor and the knee joints were higher than the hips. Delivery and supervision of its stages were conducted by the researcher.

The mothers were thoroughly supported emotionally and mentally and were never left alone.

Pain severity was measured in latent and active phases of the second, third, and fourth steps of labor. A numeral scale [visual analog scale (VAS)] and a verbal scale of McGill [present pain intensity (PPI)] were adopted to measure pain severity. Pain severity was marked in both scales in the second and third stages of labor by the client in the presence of the researcher. In the end, pain severity was measured at the end of the first hour post delivery in the fourth stage. The obtained data were analyzed by Chi-square and Kruskal–Wallis tests through SPSS ver 11. Significance level was considered as $P < 0.05$. Ethical approval was obtained from the Human Research and Ethics Committee of the Isfahan University of Medical Sciences.

RESULTS

Among 96 pregnant studied mothers, the mean age was 22.31 (2.97) years in lithotomy group, 23.75 (3.90) years in the group of sitting, and 22.56 (4.11) years in the group of squatting position. Mean gestational ages based on the first day of menstruation and sonography of the first trimester were 38.98 (0.99) and 39.22 (1.10) weeks in lithotomy group, 38.95 (1.11) and 38.92 (1.26) weeks in sitting group, and 38.74 (1.20) and 39.02 (0.82) weeks in squatting position group, respectively.

There was no significant difference in all three studied groups concerning mothers’ age ($P = 0.26$), gestational age [based on the first day of menstruation, ($P = 0.54$) and sonography of the first trimester ($P = 0.66$)], economic status, and level of education.

As seen in Table 1, in the latent phase of second stage of labor, pain severity based on VAS was significantly less in squatting and lithotomy groups compared to sitting position group ($P = 0.001$). *Post hoc* test showed no significant difference between squatting and lithotomy groups ($P = 0.79$). Frequency distribution of pain severity based on McGill PPI verbal chart in the latent phase of second labor stage showed that pain severity was significantly less in the groups of squatting and lithotomy compared to sitting position group ($P = 0.001$). *Post hoc* test showed no significant difference in the groups of lithotomy and squatting positions [Table 2]. In the active phase of second labor stage, the results showed that mean pain severity score based on numeral scale of VAS was less in the squatting group compared to the other two groups of sitting and lithotomy positions ($P = 0.024$). *Post hoc* test showed no significant difference in the two groups of sitting and lithotomy positions ($P = 0.74$) [Table 1].

Frequency distribution of pain severity based on McGill (verbal table) PPI in the active phase of second labor stage showed that pain severity was less in squatting position group compared to that in the other two groups ($P = 0.24$), and there was no significant difference in the two groups of sitting and lithotomy positions [Table 2]. In the third stage of labor, based on numeral scale of VAS, mean score of pain severity was less in the squatting group compared to the other two groups ($P < 0.05$) [Table 1].

Post hoc test showed no significant difference in the two groups of sitting and lithotomy positions ($P = 0.23$). Frequency distribution of pain severity based on McGill (verbal table) PPI in the third stage of labor showed that

Table 1: Severity (VAS) in the latent and active phases of the first, second, third, and fourth stages of labor in three groups

Group	Mean score of pain severity (0-10)							
	Latent phase of the second labor stage		Active phase of the second labor stage		Third stage of labor		Fourth stage of labor	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Lithotomy	2.27	3.37	7.41	2.18	2.25	1.39	1.33	1.64
Sitting	5.33	3.47	7.59	1.97	2.71	1.79	1.95	2.09
Squatting	2.48	3.31	6.14	2.61	1.50	1.49	1.25	1.20
P	0.001		0.024		0.009		0.194	

VAS: Visual analog scale, SD: Standard deviation

Table 2: Frequency distribution of pain severity based on PPI chart in three groups of lithotomy, squatting, and sitting positions

	Lithotomy						Sitting						Squatting						F	P
	Minor	Average	Acute	Minor	Average	Acute	Minor	Average	Acute	Minor	Average	Acute	Minor	Average	Acute					
Latent phase of the second labor stage	21	65.60	5	15.60	6	18.80	10	30.31	13	40.70	9	28.10	19	59.40	10	31.30	3	9.40	10.51	0.005
Active phase of the second labor stage	1	3.10	16	50.00	15	46.90	3	9.40	13	40.60	16	50.10	3	9.40	30	92.50	9	28.10	5.35	0.069
Third labor stage	20	62.50	12	37.50	0	0	25	78.10	7	21.90	0	0	27	84.40	5	15.60	0	0	7.66	0.022
Fourth labor stage	27	84.40	5	15.70	0	0	28	87.60	4	12.50	0	0	28	87.50	4	12.50	0	0	0.097	0.95

PPI: Present pain intensity

pain severity was less in the squatting group compared to that in the other two groups ($P = 0.009$).

There was no significant difference in the other two groups [Table 2]. In the fourth labor stage, mean pain severity score (VAS) showed no significant difference in all three groups ($P > 0.05$) [Table 1].

Frequency distribution of pain severity based on PPI in the fourth stage of delivery showed no significant difference in all three groups ($P = 0.194$).

DISCUSSION

In this trial, the participants were maintained in three positions so comfortably throughout the second stage of labor and the results suggest that the use of squatting position decreases pain severity in the second stage of labor. In a study performed in Karachi (2007), less pain experience was reported in the squatting group compared to lithotomy position group. In this study, 200 subjects in the second labor stage were put into two groups of squatting and lithotomy positions and were thoroughly investigated.^[18] As mentioned before, in the present study, pain severity in the two latent and active phases of the second labor stage was investigated. In the latent phase, pain severity was less in squatting and lithotomy groups compared to sitting position group, and in the active phase, pain severity was less in squatting group compared to the other two groups. In other words, pain severity in the second labor stage was much less in squatting position compared to other positions. These results are in concordance with those of the aforementioned study.

In another study conducted in Australia (2003), two groups in horizontal ($n = 307$) and vertical ($n = 307$) positions were compared and less pain was felt by those in vertical position group.^[23] These results are consistent with those of the present study. In a study conducted in 2006, 56 pregnant

women were compared in sitting and lithotomy positions in the first labor stage concerning pain severity and no significant difference was found. This result is not consistent with the results of the present study. In the aforementioned study, the subjects were frequently lain in sitting and supine positions.^[5] The difference can be due to the mothers' labor position. In addition, the present study was conducted in the second labor stage. In Sweden, Ragnar *et al.* (2006) compared 271 subjects in cross-legged position and sitting position and reported that pain severity in the second labor stage was more in sitting position. They reported that the reason was possibly due to more mobility in cross-legged position. They also reported more pain severity in the third labor stage in the sitting position group. Ragnar *et al.* stated that direct pressure to the muscles of pelvis bottom in sitting position causes edema and more pain after delivery,^[24] which is consistent with the present study.

In a study conducted in 2001, pain of active phase was compared in two groups of optional and routine positions. In the group of optional position, 10% selected sitting position, 4% standing position, and 36% selected a combined position. The rest of the subjects were put in routine position group. Mean pain severity score was less in optional position group compared to routine position group. About 16% of combined position group and 46% of routine position group expressed their pain as the worst.^[22]

In the present study, in the active phase of the second labor stage, six subjects in sitting position group (18.8%) and four subjects in lithotomy group (12.5%) reported their pain as killing pain, while in the squatting group, no subject reported their pain as killing pain [Table 2]. These results are in line with those of the present study. Khavandi Zadeh *et al.* measured pain severity in various positions. About 59.2% expressed their pain in optional positions including standing, sitting, and cross-legged positions as the worst and 77.4% in the routine position group (supine) reported their pain severity in the active phase of the first labor stage

as the worst as possible. Mean pain severity score was reported as 7.9 in the study group and 8.4 in the control group, with a significant difference.^[25] Since in the present study, sitting and squatting positions both benefited from spontaneous pushing with helping gravity and were not different from the standing position in Khavandi Zadeh's study, the mentioned results are in accordance with those of the present study.^[19] In another study conducted in 2010, it was reported that the feeling of low back pain was different in the two groups of sitting and supine positions in the active phase of first labor stage (the pain was less in sitting position compared to supine position). In this study, two groups of sitting position and lithotomy were compared in the first labor stage.^[26] Since the present study was conducted in the second labor stage, the difference may be due to application of positions in two different stages (the first and second labor stages) in each of these studies. In a study performed in 2007 on the association of childbirth positions and delivery pain, it was reported that various childbirth positions (sitting, squatting, and cross-leg position) have been absolutely effective on improvement of labor pain, compared to routine positions.^[27] Various studies have been conducted since olden days on the association of childbirth positions and Labour pain. Yet, there is a controversy in this regard; Melzack *et al.* (1991) in their study compared the level of low back and abdominal pain in two positions of sitting and supine and concluded that 35% of the women reported less abdominal pain and 50% reported less low back pain in sitting position compared to supine position.^[28] This finding is not consistent with the results of the present study. Renolds (1991) in Canada reported that the women who delivered in vertical positions (including squatting) tolerated their pain better and expressed this process as more pleasant, compared to the women who delivered in horizontal position.^[29] These results concerning mothers' pain severity in squatting position are consistent with those of the present study. In a study conducted in 1987, pain severity was investigated in dilatation of 2–5 cm and no significant difference was reported in general pain severity in standing and supine positions. This study was conducted in a part of labor in which the contraction number and uterine contractility were less than those in advanced labor stages. Therefore, no difference was seen in pain severity in different positions.^[30] A study performed in 1997 showed that mothers in vertical (standing) compared to horizontal (supine) position felt less low back pain,^[31] possibly due to the spontaneous pushing with helping gravity which helps the fetal descend in the labor canal, leading to speeding up and shortening the delivery length and, consequently, less pain felt. As the present study was a three-group comparison and, on the other hand, two different vertical positions (sitting and squatting) and lithotomy position were compared, it can be concluded that in the two vertical positions, pain

severity was more in sitting position compared to squatting position, although it was less in lithotomy position compared to sitting position. These findings are not consistent with those of the aforementioned study. Meanwhile, in 1978, in a study on the need for sedative medication and pain reduction in vertical and horizontal positions, no significant difference was observed.^[32] In 1975, pain severity was reported less in vertical positions compared to horizontal (supine) position.^[33] In another study conducted in 1990, it was reported that pain severity was not different in vertical and horizontal (supine) positions.^[34]

CONCLUSION

Application of various childbirth positions to reduce pain in the second labor stage is studied among three optional positions, and among the three optional positions, squatting position brings about less pain compared to the other two groups.

With regard to the findings of the present study, application of positions such as squatting during the second labor stage can positively affect labor pain reduction. This easy, applicable, and cost-effective method is suggested. It is also suggested to educate the mothers concerning all childbirth positions and let them select each of the positions voluntarily. Hospitals' supervision system of Iran can also benefit by emphasizing on application of these positions for the mothers and in the economic aspect. Further studies can clarify the advantages and disadvantages of all positions, especially sitting position, since in the present study, longer second stage was observed in this position more than in other positions. Perhaps, mothers' positioning in sitting position is adequate only at the time of pushing in the second labor stage and positioning the mother in this position from the very beginning of the second stage is not necessary.

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Conflicts of interest

There are no conflicts of interest.

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