

Perceived Environmental Stressors and Pain Perception During Labor Among Primiparous and Multiparous Women

Pirdel, Manizheh (M.Sc.)^{1*}; Pirdel, Leila (Ph.D.)²

1- Department of Midwifery, Islamic Azad University, Astara Branch, Astara, Iran.

2- Department of Immunology, Faculty of Medicine and Medical Science, Islamic Azad University, Ardabil Branch, Ardabil, Iran.

Abstract

Introduction: Pain experienced during labor is probably the most painful event in the lives of women. Environment itself influences a mother's experience of pain. Tension and stress resulting from pregnancy crisis and labor increase when the mother is hospitalized, which is concomitant with stressful situations and factors that affect pain perception during labor. The purpose of this study was to explore selected aspects of labor stress and specifically study the relationship between environmental factors and pain perception among parturient women.

Materials and Methods: This descriptive-comparative study was carried out in Tabriz Alzahra Hospital during 2005-2006. In this study, 300 primiparous and 300 multiparous women who were candidates for vaginal delivery, were randomly selected and interviewed. The data were collected by a questionnaire and the intensity of pain was determined by Visual Analogue Scale (VAS).

Results: Significant positive correlations were found between pain and tension from environmental factors in primiparous ($r=0.16$, $p<0.01$) and in multiparous ($r=0.22$, $p<0.05$) women. Furthermore, primiparous women believed that a crowded delivery room (70%) and restriction of movement and mobility (67%) contributed to their environmental stresses. Multiparas women believed that noise in the delivery ward (84%) and restrict of fluid intake (78%) increased their stresses.

Conclusion: Performance of routine diagnostic tests in hospitalized pregnant woman, provision of invasive medical care during labor process and a noisy and crowded environment all influence the mother's experience and perception of pain. Therefore, the medical staffs seem to play a great role in alleviating labor pain by reducing stressors, especially the objective ones that are more stressful.

Keywords: Environmental factors, Stress, Labor pain, Pain Perception, Primiparous, Multiparous.

To cite this article: Pirdel M, Pirdel L. Perceived Environmental Stressors and Pain Perception During Labor Among Primiparous and Multiparous Women. *J Reprod Infertil.* 2009;10(3):217-23.

*Corresponding Author:
Manizheh Pirdel,
Department of
Midwifery, Islamic Azad
University, Astara
Branch, Astara, Iran.
E-mail:
pirdelm@yahoo.com

Received: May 20, 2009

Accepted: Sept. 16, 2009

Introduction

Stress is defined as a biological response elicited when an individual perceives a threat to his/her homeostasis and the threat causing stress is referred to as a stressor (1, 2). Stress has been also defined as "a dynamic, progressive relationship between the person and the environment" (3,4). Several studies have found

that stress has a dichotomous nature; it has both good and bad sides. Both of these effects have been documented to affect all aspects of human condition (e.g. physiological, psychological, cognitive, and social dimensions) for the past six decades (5-8). For the purposes of this study, labor stress is defined as the level of psycho-

logical stress, representing a combination of fear and pain, which is experienced by women during labor.

Labor, as a life event, is characterized by tremendous physiological and psychological changes that require major behavioral adjustments in a short period of time (6,8-9). Consequently, the process of labor constitutes a unique set of "stressors" that challenges a woman's ability to cope. Labor stress has been shown to trigger and enhance adaptive responses in both mother and fetus, which may contribute to the prevention of adverse labor outcomes such as fetal and/or maternal morbidity and mortality. Conversely, labor stress has been linked to detrimental outcomes including immunosuppression, fluid and electrolyte imbalances, delayed wound healing, diminished uterine contractions and prolonged labor in the mother (6). Furthermore, labor stress may cause poor adaptation to extrauterine life and create neonatal conditions including heart anomalies, respiratory distress, impaired immunity, hyperbilirubinemia, and necrotizing enterocolitis. Wijma *et al.* (1998) have also reported that labor stress can have deleterious effects on neonatal neural development and behavior including impaired motor ability, impaired balance reactions, shorter attention spans, impaired muscle coordination and tonicity, greater infant irritability, and decreased coping ability.

Labor stress may also contribute to depression, development of concerns regarding children, concerns about parenting capacities, negative interpretations of the pregnancy experience, and decreased confidence (9). Furthermore, a high degree of labor stress has been associated with cesarean delivery, increased numbers of labor procedures and longer labors (10-12).

Labor pain is a complex and subjective interaction between multiple physiologic, psychosocial, environmental plus cultural factors and a woman's interpretation of labor stimuli (13). It must be emphasized that a woman's internal experience of pain is affected by the environment in which she is laboring. The labor environment includes the totality of the animate and inanimate forces that influence women's experience. These factors include the persons who are present and their verbal and nonverbal communications; the quality of support the woman feels from those

presets; the degree the environment is strange, including objects such as furniture and equipment; noise; light; temperature; space for movement; hospital beds; monitors; vaginal examinations and some routine procedures such as intravenous injections; restriction of fluid intake; constant evaluations of the fetus's heart beats; limitations of mother's mobility, etc (14-17). Although some levels of anxiety is considered normal during labor, excessive anxiety is an emotional factor that results in severe pain due to a decrease in pelvic blood flow and increased muscle tension, as a result of an increase in the secretion of catecholamines (13). Hodnett (18) finding that physical birth environment, immobility and medical intervention influence women's evaluation of their childbirth experiences and can affect pain experience. In addition some studies have reported that anxiety may be precipitated during the course of labor through the environmental factors such as noise and unfamiliarity (13).

In general, any event associated with oxytocin release is highly dependent on environmental factors (copulation, parturition, lactation, etc.) (19). Many women have had the experience of their labor stopping when they have entered unfamiliar surroundings and crowded wards of a hospital. However, women choose to give birth in hospitals because they believe they are "safer" than giving birth in other places. When a laboring woman does not feel safe or protected or when the progress of her normal labor is altered, catecholamine levels rise and labor slows down or even stops (20).

Intervention to reduce pain and discomfort during labor and birth is a major part of modern obstetric care of laboring women. It is important for midwives to explore various strategies for diminishing or managing the pain caused by labor and birth. Many strategies may be adopted to alleviate pain and a major responsibility of the midwife is promoting and using nonpharmacological techniques to minimize labor pain (21).

There are few studies on environmental factors and their relationship with labor pain. Hence, further exploration of the complex phenomenon of labor stress should take place if positive outcomes in reproductive health are to be achieved. Environmental stressors are likely to vary not only from country to country but from individual to

individual. The present study explores perceived environmental stressors and pain perception among some Iranian parturient women.

Materials and Methods

The present descriptive-comparative study was carried out on 600 primiparous and multiparous women, who had vaginal deliveries in Tabriz Alzahra Hospital during 2005-2006. The subjects were selected using a random sampling method.

The inclusion criteria included having gestational ages of 37-42wk; absence of any verbal communication limitations; no history of psychological problems before or during pregnancy; vaginal delivery candidacy; absence of fast or prolonged (difficult) delivery, presence of a live and healthy fetus, no need for the use of auxiliary instruments during delivery such as forceps or vacuum extraction; no analgesic intake and being a singleton pregnancy.

The data was collected by two questionnaires. The demographic questionnaire consisted of 40 questions on personal, social and obstetric particulars that had been tailored for the study after an extensive review of the literature. To assess labor stress in physical dimensions, an environmental factor questionnaire was used. The questionnaire was composed of a 20 Likert type (four-point scale) items that ranged from none (0) to high (3). High scores on the environmental factor questionnaire (>17) indicating more tension from the aforementioned factors and hence depicting more stress.

Content and construct validity methods were used to validate the questionnaires. The reliability of questionnaires was tested using test-retest, yielding the following results. Reliability coefficients for the environmental factors questionnaire was 0.79. Furthermore, Visual Analogue Scale (VAS) was used for the assessment of perceived pain. VAS is a 10-centimeter straight line that represents a continuum of pain intensity. There are verbal anchors at each end of the line: "no pain" and "worst possible pain". Subjects place a mark on the line that represented their level of pain intensity. The distance from the left hand-side quantifies pain level. The test-retest reliability of VAS on recalled labor pain in postpartum women was high ($r=0.95$), (22).

The parturient women were interviewed after signing an informed consent form and after their physical condition allowed an interview. The data was collected after delivery and during the fourth stage of labor.

The data were analyzed by WIN/SPSS 13 statistical software. Descriptive statistics such as frequency, mean and standard deviation were used to analyze the data. In addition, sample t-test was used to compare the means. To determine the association between environmental factors and pain, Pearson's correlation was used. Linear regression analysis was performed to evaluate the environmental factors influence on pain. The level of statistical significance was set at $p<0.05$.

Results

The mean age of the primiparas and multiparas was 22.8 ± 3.9 and 27.7 ± 6.6 yrs, respectively. Approximately, 33.7% of the primiparous and 23% of the multiparous women had attended elementary schools. A total of 83% of the primiparous and 83.3% of multiparas women were housewives. Almost 51.3% of the primiparas and 66.7% of the multiparas had a gestational age of 37-38 and 39-41 weeks respectively.

The mean weights of the newborns were 3236.5 ± 4.2 and 3650.03 ± 3.2 gr for the primiparas and multiparas, respectively. Approximately, 97% of the primiparas and 94.7% of multiparas had planned pregnancies. For 81.3% of the primiparous and 69% of the multiparous women pregnancy was a pleasant experience. The mean of the mothers' height in primiparas and multiparas were 163.4 ± 4.9 and 163.2 ± 4.9 cm, respectively.

The means of weight gain during pregnancy were 9.68 ± 2.1 and 9.65 ± 2.3 kg in the primiparas and multiparas, respectively. The means of the

Table 1. Cross-tabulation between reported pain level and parity of the sample

Pain level	Primiparas n (%)	Multiparas n (%)
6	3 (1%)	8 (2.7%)
7	68 (22.7%)	72 (24%)
8	101 (33.7%)	92 (30.7%)
9	88 (29.3%)	58 (19.3%)
10	40 (13.3%)	70 (23.3%)
Total	300 (100)	300 (100)

Scores of pain (0-5) were not reported in the present study.

Table 2. Distribution of mothers according to Tension and stress levels (n=600)

Tension and stress levels	Primiparas n (%)	Multiparas n (%)	t-test	P-value
Mild	116 (38/6%)	67 (22/3%)		
Moderate	161 (53/7%)	206 (68/7%)	5.98	p<0.0005
Severe	23 (7/7%)	27 (9%)		
Mean±SD	9.9±3.6	11.9±4.3		

duration of the active phase of labor were 5.86±1.6 and 4.97±1.7 hours in the primiparas and multiparas, respectively. The mean duration for the second phase of labor was 14.9±3.4min in the primiparas and 12.7±3.7min in the multiparas.

Table 3. Mean and standard deviations (M±SD) of environmental factors questionnaire in the two groups (n=300)

Item	Primiparas	Multiparas
Unfamiliar persons	0.57±0.50	0.16±0.37
Strangeness of the environment	0.45±0.30	0.29±0.17
Attendants restriction	1.40±0.58	0.88±0.74
Ward overload	0.10±0.03	0.67±0.46
Large numbers of patients	1.82±0.43	0.74±0.36
Noise	0.62±0.48	1.49±0.70
Furniture and equipment	0.16±0.37	0.45±0.30
Hospital beds	0.84±0.36	0.43±0.50
Room temperature	0.28±0.12	0.31±0.28
Room lighting	0.44±0.25	0.47±0.38
Space of the delivery room	0.52±0.48	0.49±0.10
Intravenous infusions	0.65±0.50	0.59±0.47
Catheterization	0.30±0.19	0.22±0.17
Drug Injections	0.12±0.07	0.18±0.08
Fetal monitoring	1.10±0.51	0.97±0.48
Restriction in movement and mobility	1.21±0.58	0.83±0.51
Maternal position	0.65±0.47	0.78±0.41
Lack of privacy	0.59±0.43	0.11±0.08
Vaginal examinations	0.95±0.48	0.85±0.53
Restrict of fluid intake	0.65±0.28	1.72±0.68

Values in this table are the mean score of each item in each group.

Approximately, 58% of the primiparas and 42% of the multiparas reported undergoing 5-7 vaginal examinations during labor.

In the present study 76.3% of the primiparas and 73.3% of the multiparas reported delivery pain scores of ≥8, which indicates the most severe pain experienced by an individual Table 1. The means of pain scores in primiparous and multiparous women were 8.31±0.99 and 8.37±1.16, respectively. Comparison of pain scores between the two groups using Student's t-test did not demonstrate any statistically significant relationship (p=0.63). A total of 53.7% of the primiparas and 68.7% of the multiparas had moderate levels of tension.

Comparison of the means of environmental factors between the two groups revealed a statistically significant relationship (p<0.0005), Table 2. Approximately, the greatest stressors faced by the primiparas related to the large number of patients in the delivery room (70%) and restriction of movement and mobility (67%) and the lowest was related to ward overload (10%). In the multiparas, the greatest stressor was related to noise in the delivery ward (84%) and restriction of fluid intake (78%) and the lowest level of stress was related to lack of privacy (11%) Table 3. Regardless of any other variables, multiparous women scored higher on the environmental factor questionnaire than primiparas women, in general.

In this study significant positive correlations were found between pain and labor stress from environmental factors in primiparas (r=0.16, p<0.01) and in multiparas (r=0.22, p<0.05). Linear regression analysis showed that environmental factors were major predictors of pain in primiparas (β=0.654, R²=0.83, p<0.05) and multiparas (β=0.574, R²=0.69, p<0.05).

Discussion

Comparison of labor pain and environmental factors in its perception in primiparous and multiparous Iranian women in Tabriz demonstrated that women consider labor a painful experience, irrespective of the number of previous deliveries, and the majority of the subjects in the present study reported a high score of pain during labor (≥8). The results of the present study are consistent with the results of the study carried out by Abushaikha *et al.* (23).

In the context of labor, there is a dynamic and reciprocal relationship between the woman who is experiencing labor and the birthing environment. The relationship is dynamic because stress during labor is a changing entity that easily shifts from eustress to distress and vice versa throughout the different stages of labor. It is reciprocal because the birthing environment exerts certain stresses on a woman who is giving birth and in return, the woman produces certain stress responses.

Environment can influence pain perception in women. In the present study, there was a statistically significant relationship between environmental factors and labor pain in both groups. A parturient woman's stress and anxiety may be aggravated by environmental factors such as noise or an unfamiliar environment (13). In this study, multiparas reported that noise in the delivery ward increased their stress. This finding is in agreement with the findings of Rhudy (16). They found that noise exposure resulted in fear and physiological arousal which might enhance pain processing.

Noise, temperature of the labor room, light and the feeling of being observed are some of the main factors that can stimulate human neocortex. Beta endorphin is one of the endorphin hormones which are released by the brain in times of stress or pain. Therefore, unpleasant noise can stimulate the brain and release Beta-endorphins that can slow labor by reducing oxytocin (19).

In the present study, primiparous women believed that restriction in movement and mobility contributed to environment stress and tension. Lugin *et al.* (15) demonstrated that immobility during labor generally has a negative effect and it increases pain. This finding is similar to the present study. Bloom *et al.* (24) noted that moving freely in the labor room, improves a woman's sense of control, decreases the need for pain medications, and it may reduce the length of her labor. Sometimes it is hard to move in labor room due to routine procedures such as continuous monitoring of the baby's heart rate and intravenous lines. There is agreement that many women desire mobility during labor and evidence does not exist that such activity could be harmful to the fetus or to the mother (24). Mobility decreases anxiety and reduces the labor pain (15).

The lowest level of stressors was related to ward overload in primiparas but the study carried out by Delaram *et al.* does not confirm this finding. They

found that bright and dim lights were less important environmental stressors (17).

In many birthing units, it is common practice to restrict oral fluid intake during labor and delivery (25). According to several studies, the practice of eating and drinking during labor does not impose a threat and, in fact, they may benefit laboring women. Benefits of oral intake during labor include maternal satisfaction, maintenance of serum glucose, preservation of muscle glycogen and a possible reduction in maternal fatigue (26, 27). McErleen (28) reviewed the historic importance and function of the taken food and fluids during labor. He noted that if intravenous therapy was initiated to treat dehydration, other interventions were more likely to follow. He concluded that positive practices such as providing nutrition would prevent dehydration and ketosis, minimize analgesic requirements and improve the laboring women's moral. In this study, multiparous women reported that restriction of fluid intake increased their stress and pain. This finding is consistent with the findings by Fowles (29). He found that restricting oral intake during labor added to labor stress. However, the study carried out by Klassen (26) does not confirm this finding. He noted that there were no differences in feeling pain with or without restricting drinking. Furthermore, Parsons *et al.* (30) found that mothers who ate food in the labor room tended to experience a longer labor. In general, as the duration of delivery increases the mother gets more tired and this leads to a decrease in the individual's capacity to tolerate environmental conditions and an increase in the mother's anxiety about herself and her baby, which in itself retards the progression of the labor process. Fear from not eating and drinking during labor is a predictor for increased perception of pain in labor.

In multiparas, the lowest levels of stressors were related to lack of privacy. Lothian (20) noted that lack of privacy would induce catecholamine surge that would terminate early labor, make contractions ineffective and cause severe pain. In our study, privacy was less important for many women. This disparity between the results of the present study and other studies might be attributed to the influence of different environmental contexts of birth and culture.

The results of this study emphasize the important role that midwives could play in alleviating labor stress. Dannenbring (31) demonstrated that con-

stant support for parturient women by midwives, especially psychological support, is an important factor in decreasing labor pain. Support from midwives relieves labor pains and at the same time changes the parturient women's attitude toward labor pain to a positive one and helps them easily bear it.

The physical environment in which women undergo labor and give birth can have a great effect on the amount of fear and anxiety they experiences. On the other hand, positive aspects of birth environment are associated with positive outcomes such as lower rates of analgesia, lower augmentation and operative delivery, as well as greater satisfaction with the given care (32). A physically more pleasant environment, which is very clean, welcoming, warm, smelling nice and aesthetically pleasing, can help women relax, particularly when labor is long. Hospitals are strange and uninviting places where we have usually experienced stress or pain. When giving birth, these feelings are more likely to be felt. By making the labor suite more comfortable and less hospital like, mothers are likely to be more relaxed and have an easier labor.

It should be emphasized that some disparities between the results of the present study and other studies might be attributed to the influence of cultural differences in pain perception, the individuals' different attitude to pain, educational achievements and the types of facilities available in delivery rooms in different countries. Lack of sufficient interaction with parturient women, ward overload with differing populations, fatigue experienced by the mothers, differing past labor experiences between multiparas and primiparas may affect the type and intensity of stressors.

Pain should be considered a general and not just a physical experience. Since pain does not seem to serve any known purpose for the mother and the baby and only leads to severe complications, easing such pain can transform labor into an enjoyable experience throughout a mother's life and lead to a sharp decrease in demands for cesarean deliveries. We can help women to better cope with labor pain by improving and modifying the environment, providing privacy, avoiding unnecessary procedures and identifying sources of fear or disturbance and re-moving them.

Conclusion

These finding support the important role of physical factors on pain perception. Such an understanding will not only help patients learn how to participate in their own pain control, but will also help the clinicians create a nurturing environment. Psychological factors may increase perceived pain during labor. Many of these factors are attributes of the laboring women, and others are components of their relationships with others and the environment. Therefore, it is suggested that for a better understanding of pain perception in labor and birth, psychological factors that have different meanings to different women be foci of future studies. Further investigations pertaining to labor stress are warranted due to limited studies in this area of research.

Acknowledgement

We wish to sincerely thank the support of all the staff of Tabriz Nursing and Midwifery Faculty and all the colleagues in Alzahra Hospital. Furthermore, our special thanks go to the mothers, who wholeheartedly and actively assisted us to carry out this research.

References

1. von Borell E, Dobson H, Prunier A. Stress, behavior and reproductive performance in female cattle and pigs. *Horm Behav.* 2007;52(1):130-8.
2. Monat A, Lazarus RS. *Stress and Coping: An Anthology.* 3rd ed. New York: Columbia University Press; c1991. Chapter 1, History and present status of the stress concept; p. 1-17.
3. Lazarus RS, Folkman S. *Stress, appraisal, and coping.* 2nd ed. New York: Springer Publishing Company; c1984. Chapter 1, The stress concept in the life sciences; p. 1-21.
4. Lazarus RS, Folkman S. *Stress, appraisal, and coping.* 2nd ed. New York: Springer Publishing Company; c1984. Chapter 7, Appraisal, coping and adaptation and outcomes; p. 207-27.
5. Younger JB. A model of parenting stress. *Res Nurs Health.* 1991;14(3):197-204.
6. Alehagen S, Wijma K, Lundberg U, Melin B, Wijma B. Catecholamine and cortisol reaction to childbirth. *Int J Behav Med.* 2001;8(1):50-65.
7. Alehagen S, Wijma B, Lundberg U, Wijma K. Fear, pain and stress hormones during childbirth. *J Psychosom Obstet Gynaecol.* 2005;26(3):153-65.

8. Baron SR, Cusumano MA, Evans DC, Hodne CJ, Logan H. The Effect of Desired Control and Anticipated Control on the Stress of Childbirth. *Basic Appl Soc Psych*. 2004;26(4):249-61.
9. Wijma K, Wijma B, Zar M. Psychometric aspects of the W-DEQ; a new questionnaire for the measurement of fear of childbirth. *J Psychosom Obstet Gynaecol*. 1998;19(2):84-97.
10. MaClean LI, McDermott MR, May CP. Method of delivery and subjective distress: women's emotional responses to childbirth practices. *Reprod Infant Psychol*. 2000;18(2):153-62.
11. McNiven PS, Williams JI, Hodnett E, Kaufman K, Hannah ME. An early labor assessment program: a randomized, controlled trial. *Birth*. 1998;25(1):5-10.
12. Sadler LC, Davison T, McCowan LM. Maternal satisfaction with active management of labor: a randomized controlled trial. *Birth*. 2001;28(4):225-35.
13. Lowe NK. The pain and discomfort of labor and birth. *J Obstet Gynecol Neonatal Nurs*. 1996;25(1):82-92. Review.
14. Lowe NK. The nature of labor pain. *Am J Obstet Gynecol*. 2002;186(5 Suppl Nature):S16-24. Review.
15. Lugina H, Mlay R, Smith H. Mobility and maternal position during childbirth in Tanzania: an exploratory study at four government hospitals. *BMC Pregnancy Childbirth*. 2004;4(1):3.
16. Rhudy JL, Meagher MW. Noise stress and human pain thresholds: divergent effects in men and women. *J Pain*. 2001;2(1):57-64.
17. Delaram M, Aein F. [Survey of delivery room Stressors in Hajar hospital, 2000]. *J Shahrekord Univ Med Sci*. 2000;2(2):28-33. Persian.
18. Hodnett ED. Pain and women's satisfaction with the experience of childbirth: a systematic review. *Am J Obstet Gynecol*. 2002;186(5):160-72.
19. Odent M. New reasons and new ways to study birth physiology. *Int J Gynaecol Obstet*. 2001;75 Suppl 1:S39-45.
20. Lothian JA. Do not disturb: the importance of privacy in labor. *J Perinat Educ*. 2004;13(3):4-6.
21. McCrea BH, Wright ME. Satisfaction in childbirth and perceptions of personal control in pain relief during labour. *J Adv Nurs*. 1999;29(4):877-84.
22. Phumdoung S, Rattanaparikonn A, Maneechot K. Pain during the first stage of labor. *Songkla Med J*. 2004;22(3):163-71.
23. Abushaikha L, Oweis A. Labour pain experience and intensity: a Jordanian perspective. *Int J Nurs Pract*. 2005;11(1):33-8.
24. Bloom SL, McIntire DD, Kelly MA, Beimer HL, Burpo RH, Garcia MA, et al. Lack of effect of walking on labor and delivery. *N Engl J Med*. 1998;339(2):76-9.
25. Beggs JA, Stainton MC. Eat, drink, and be labouring? *J Perinat Educ*. 2002;11(1):1-13.
26. Klassen FE. The effect of unrestricted fluid intake during labor on the multiparous woman and her perception of control and pain during childbirth [master's thesis]. Winnipeg (Manitoba): Department of Nursing University of Manitoba; 1999. Results 4, primary hypotheses: control and pain; p. 49-51.
27. Maharaj D. Eating and drinking in labor: should it be allowed? *Eur J Obstet Gynecol Reprod Biol*. 2009;146(1):3-7.
28. McErleen KS, editor. The harvest is rich but the laborers are starved. The 23rd International Congress of Midwives; 1993 May 9-14; Vancouver, Canada, London: International Confederation of Midwives; c1993. 1257 p.
29. Fowles ER. Labor concerns of women two months after delivery. *Birth*. 1998;25(4):235-40.
30. Parsons M, Bidewell J, Griffiths R. A comparative study of the effect of food consumption on labour and birth outcomes in Australia. *Midwifery*. 2007;23(2):131-8.
31. Dannenbring D, Stevens MJ, House AE. Predictors of childbirth pain and maternal satisfaction. *J Behav Med*. 1997;20(2):127-42.
32. Lock LR, Gibb HJ. The power of place. *Midwifery*. 2003;19(2):132-9.