

## Factors Affecting the Labor : A Review Article

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### ABSTRACT

The aim of this review is to describe pharmacological and non-pharmacological factors that have an effect on duration of the labor. Approximately all published articles from 1980–2013 in Medline and Embase were searched amongst them 118 articles were selected. The eligible studies were those that reported the labor length, labor duration and active labor. Studies including preterm, premature and labor induction were excluded and finally fifty-six articles were reviewed. Oxytocin, propranolol, Pethidine, Epidural analgesia, Nitrous Oxide and Intravenous Hydration are common pharmacological methods affecting the labor duration. Massage, Birth ball, Acupressure, Oral carbohydrate intake, Presence of companionship, Water birth delivery and Parturient position are considered as the main effective non-pharmacological methods on labor duration. Implementation of non-pharmacological methods, as effective factors on labor duration, is recommended.

**Key words:** Labor duration, Non- pharmacological factors, Pharmacological factors.

### INTRODUCTION

Factors influencing maternal and neonatal outcome of pregnancy have been considered by researchers<sup>1</sup>. The length of active phase of labor has been significantly longer while the second stage has been shorter in the past 20 years<sup>2</sup>. Duration of labor varies widely depending on demographic, clinical, genetic factors<sup>3</sup>, uterine activity, fetal lie or presentation and number of fetus<sup>4</sup>. The active labor is slower in parturient who are homozygous for “G” at oxytocin receptor gene rs53576 transitioned<sup>5</sup>. About 30% of all births choose the cesarean delivery due to the failure of labor progress or dystocia<sup>6</sup>. Due to side effects of prolonged labor, there are multiple ways to reduce the labor duration. This approach is divided into two groups; the pharmacologic and non-pharmacologic methods. The aim of this review is to analyze the pharmacological and non-pharmacological factors effecting the duration of the labor.

### METHODS

At the first stage, both Medline and Embase database were systematically searched during 1980 until now by which 118 citations were selected. At the next stage, a checklist including some information about study objectives, sampling methods, type of study and main findings were extracted from the abstracts resulting in excluding of ineligible papers. The eligible studies were those that have reported the labor length, labor duration, active phase, active labor, and effective factors on labor duration, labor dystocia, labor augmentation, delivery, childbirth duration and reduction the cesarean sections. Active labor, as a main key word, defined as onset of clinical criteria usually dilatation between 3–5 cm in the presence of uterus contractions. However, studies including preterm labor, premature labor and labor induction were excluded.

Out of 122 abstracts, 92 (75%) papers were categorized as potentially eligible for this systematic review. The qualitative assessment of the articles was conducted using research criteria. Finally at the last stage 56 (46%) full text articles were used for the current review (Figure 1).

## RESULTS

We divided factors affecting the labor duration into two groups; Pharmacological and Non-pharmacological methods.

### Pharmacological methods

#### Oxytocin

Labor dystocia due to reduce uterine contractions is one of the main causes leading to cesarean section<sup>6, 7</sup>. In such conditions often oxytocin infusion is used for augmentation of the uterus contractions<sup>8-10</sup>. Administration of Oxytocin to strengthen the uterus contractions and reducing the labor duration is rising widely<sup>11</sup>. Despite the benefits of oxytocin, this method is not without complications<sup>12-15</sup>.

#### Propranolol

Some researchers who have evaluated the effect of oral propranolol on duration of labor have reported that the duration of active phase and second stage of labor have significantly been shorter in propranolol group than the control group. Cesarean section rate was significantly lower in the propranolol group without maternal and neonatal side effects<sup>16</sup>. The first uncontrolled study on the use of propranolol in dysfunctional labor that was done about four decades ago, reported some promising results<sup>17</sup>. Sanchez-Ramos et al compared the effect of oxytocin plus intravenous propranolol infusion with oxytocin plus placebo in abnormal active phase of labor. The frequency of cesarean delivery was lower in propranolol compared with the placebo group<sup>18</sup>. In other study, 57 multiparous parturient in active phase were randomly assigned into two groups. The frequency of cesarean section due to labor dystocia was 2 times in control group compared to the propranolol group (13.6%, 6.25 respectively). The neonatal and maternal outcome were similar in both groups<sup>19</sup>. However, in other study, women who received propranolol for labor induction<sup>20</sup> or labor augmentation did not show any decrease in

the frequency of cesarean delivery<sup>21</sup>.

#### Pethidine (Meperidine)

Pethidine, Meptazinol and Piritramide are the most common opoides used in parturient during labor in Germany<sup>22</sup>. Pethidine or Meperidine hydrochloride is the first synthetic opioid synthesized in 1932. Intramuscular Pethidine analgesia during the first stage of labor hasn't significance side effect<sup>23</sup>. Pethidine and Tramadol have similar effect on labor duration. Pethidine is a better choice than Tramadol in obstetric analgesia<sup>24</sup>. Pethidine can shorten the duration of active labor in Nulliparous women with normal pregnancy and term gestational age<sup>25</sup>. In contrast, other study reported that the use of Pethidine caused the slower labor<sup>26</sup>. A randomized clinical trial indicated that both Meperidine and control groups have an equal duration of labor. The pH of the umbilical cord arterial was lower in the Meperidine group compared with the control group; although the difference was not statistically significant<sup>27</sup>.

#### Epidural analgesia

Epidural regional analgesia is introduced as the gold standard for obstetric analgesia. It has high value and less central nervous system depression<sup>22</sup>. In a prospective study that investigated the effect of epidural analgesia on the duration of labor and the delivery outcome, all parturient were divided into two groups: epidural analgesia and control group. Epidural analgesia group had longer duration of first and second stage of labor than the control group. The frequency of oxytocin augmentation, emergency cesarean section, instrumental delivery, meconial amniotic fluid and low Apgar scores were similar in two groups<sup>28</sup>. In another prospective study that compared the effect of combined spinal epidural (CSE), epidural (E) and IV Pethidine analgesia on the labor progresses overall, sixty parturient in active labor were allocated to five subgroups. The used of epidural increased the duration of first stage of labor compared with the CSE and IV Pethidine groups<sup>29</sup>. The used of epidural analgesia led to prolonged duration of labor and increased Oxytocin requirements<sup>30</sup>.

#### Nitrous oxide

A study evaluated the effect of the inhalation of nitrous oxide premixed with oxygen

in labor. Overall two hundred pregnant women allocated in two groups. The first group received nitrous oxide premixed with oxygen as control group and the second group received oxygen only. Based on the results the use of inhalation of nitrous oxide premixed with oxygen (50%:50%) is a safe, effective and easy method in parturient<sup>31</sup>. The use of 50% nitrous oxide during labor decreases duration of active phase compared with control group<sup>32</sup>. Several studies confirmed the efficacy and safety of nitrous oxide for labor<sup>33, 34</sup>.

### **Intravenous hydration**

The effect of increased intravenous hydration on labor duration is widely investigated<sup>35, 36</sup>. Previous study reported that hydrated women had shorter labor duration than insufficiently hydrated. Sufficient hydration had not any significant effects on the neonatal outcomes<sup>37</sup>. However, in a recent study, intravenous hydration did not decrease labor duration<sup>7</sup>. In a study, the mean duration of labor and the incidence of prolonged labor were not statistically significant reduction in patients receiving intravenous hydration<sup>38</sup>.

### **Non Pharmacological methods**

#### **Massage**

Delivery maybe is one of the most painful events that women experience during their lives<sup>39</sup>. Parturient women have a high level of stressful pain that may negatively affect both mothers and neonates. The analgesics have previously been used for parturient women. Nowadays, the limitations and critical side effects of analgesics are well-known. Therefore, non-pharmacologic methods such as massage and music therapies are being broadly recommended<sup>40</sup>. The increase of catecholamines caused pain and anxiety, which induced the prolonged labor. Hence, the use of the methods of pain relieving can reduce the rate of prolonged labor<sup>40, 41</sup>.

#### **Birth ball**

Since 1987 birth ball has been used to improve the process of labor. Application of birth ball causes turning of fetus head in the mother's pelvis thereby; duration of labor will be shorter. The safety of birth ball has been proven<sup>42</sup>. In a randomized controlled trial study, 60 Primiparous women aged 18 to 35 years were assigned into birth

ball and control groups. There were no significant differences between duration of the active phase and the interval uterine contractions between groups<sup>43</sup>. In a randomized controlled trial, 188 women were allocated into two groups including intervention and control groups. The intervention group trained for at least 20 minutes three times a week for an episode of 6–8 weeks. Women in intervention group received a birth ball for use during labor. They encouraged every hour to select the suitable positions, movements, and activity. Both groups received standard care from hospital staff nurses in every way of pregnancy and delivery. The results shown that application of the birth ball exercise program could be considered as an impressive tool to improve childbirth and delivery<sup>44</sup>.

### **Acupressure**

Acupressure and Acupuncture have varied use in gynecology and midwifery<sup>45-47</sup>. Acupressure is impressive intervention on reduction of the cesarean section. The use of acupressure during labor has been recommended as an effective factor<sup>48</sup>. In a study evaluate the effects of SP6 acupressure on labor duration among seventy-five parturient, SP6 acupressure group had shorter total labor duration compared with control group<sup>49</sup>. LI4 acupressure at the beginning of the active phase, is effective on reduction of labor duration without adverse maternal and neonatal effects<sup>50</sup>. However, another study reported that the use of Acupuncture did not influence the duration of labor. Both Apgar score at 5 minutes and umbilical cord pH were significantly higher among infants in the Acupuncture group compared with infants in the other group<sup>51</sup>.

### **Oral carbohydrate intake**

Insufficient uterine contractions is influenced by physical factors<sup>52</sup> such as need of energy, eat and drink during labor. The energy requirements of the active phase of labor estimated 50 to 100 calories per hour and it is comparable with moderate energy requirements in aerobic exercise<sup>53</sup>. The uterine muscle contractions have requires a constant energy. Since the early 1940s, the policy limits drinking during labor has started to run wide without any evidence of a beneficial effect on improving maternal and neonatal outcome<sup>54</sup>. Proponents believe that eating and drinking restrictions reduce the mother's risk of aspiration during general anesthesia<sup>55, 56</sup>. However, recent studies have shown that this policy

hasn't guaranteed lower volume of gastric contents in patients with general anesthesia<sup>5, 57</sup>. As well as, the self-regulated intake of drink and food during labor can help reduce stress and create a feeling of control<sup>7</sup>.

### Presence of companionship

In 1985, the World Health Organization (WHO) announced a voluntary choice of companionship to ensure the safety and satisfaction of mothers. A study has been supported this theory<sup>58</sup>. Presence of companionship may improve uterus contractions and uterus blood flow by reduction of mothers' anxiety. However, usually the mother's emotional needs forgotten in labor due to much attention of mothers physical needs<sup>59</sup>. Studies have shown that use of Doula or trained companionship can reduce the duration of labor<sup>60, 61</sup>.

### Water birth delivery

Today, many countries are using a non-invasive and non-pharmacologic method named water birth delivery. Using this method increases the pain threshold and cause uterine contractions become effective. Delivery process in the water, is much more tolerable without medical intervention<sup>42</sup>. A 9-year prospective study compared overall 9518 women allocated in two groups. The first group included 3617 women in water birth delivery and the second group 5901 women in routine methods delivery. Based on the results, the water delivery was better and more useful for mother and newborn in comparing with the routine methods of delivery<sup>11</sup>. Furthermore, water birth delivery can reduce the first stage of labor<sup>62</sup>. It is a very good option for parturient women<sup>63</sup>. Water birth delivery is useful in labor dystocia and prolonged labor. It also reduces the need of medical intervention<sup>14</sup>. In a study seventy

women in water birth method were compared with seventy women in routine methods delivery. The duration of the active phase of labor was same in both groups. However, the duration of the second stage of labor was nine minutes longer in women who have deliveries in water which can be attributed to the hydro analgesic effect of water. It partially inhibits uterine contractions in labor, but does not have any interactions with the delivery process<sup>15</sup>.

### Parturient position

Molina et al showed increasing the frequency and intensity of uterus contractions with standing position<sup>64</sup>. In a randomized trial evaluated the effect of different positions in labor duration among 1000 parturient. Based on the results the walking in labor has not adverse effect or exacerbated the labor progress<sup>65</sup>. Storton et al believed that walking in the labor is not harmful for women<sup>66</sup> and had lower abnormal fetal heart rate pattern<sup>67</sup>.

## CONCLUSIONS

There are many pharmacological and non-pharmacological factors affect of labor duration. Oxytocin, Propranolol, Pethidine, epidural analgesia, nitrous oxide and intravenous hydration are main pharmacological factors affect of labor duration. Non- pharmacological factors affect of labor duration are including; Massage, birth ball, acupressure, oral carbohydrate intake, presence of companionship, water birth delivery and parturient position. Adverse neonatal and maternal outcomes haven't reported by using the non-pharmacological methods, therefore, these methods are recommended for reduce of labor duration in parturient.

## REFERENCES

1. Direkvand-Moghadam A, Khosravi A, Sayehmiri K. Predictive factors for preeclampsia in pregnant women: a univariate and multivariate logistic regression analysis. *Acta Biochim Pol.* 59(4):673-7 (2012).
2. Yang L, Xu BY, Hu YL. [Change of labor duration:a systematic analysis]. *Zhonghua Fu Chan Ke Za Zhi.* 47(6):431-5 (2012 ).
3. Terkawi AS, Jackson WM, Thiet MP, Hansoti S, Tabassum R, Flood P. Oxytocin and catechol-O-methyltransferase receptor genotype predict the length of the first stage of labor. *Am J Obstet Gynecol.*,207(3):184 e1-8 (2012).
4. Silver RK, Haney EI, Grobman WA, MacGregor SN, Casele HL, Neerhof MG. Comparison of active phase labor between triplet, twin, and singleton gestations. *J Soc Gynecol Investig.*

- ;7(5):297-300 (2000).
5. Kubli M, Scrutton MJ, Seed PT, O'Sullivan G. An evaluation of isotonic "sport drinks" during labor. *Anesth Analg.* ;**94**(2):404-8, table of contents (2002).
  6. Coco A, Vernacchio L, Horst M, Anderson A. Management of acute otitis media after publication of the 2004 AAP and AAFP clinical practice guideline. *Pediatrics.*;**125**(2):214-20 (2010).
  7. Coco A, Derksen-Schrock A, Coco K, Raff T, Horst M, Hussar E. A randomized trial of increased intravenous hydration in labor when oral fluid is unrestricted. *Fam Med.* ;**42**(1):52-6 (2010).
  8. Saunders N, Spiby H. Oxytocin in active-phase abnormalities of labor: a randomized study. *Obstet Gynecol.* ;**76**(3 Pt 1):475 (1990).
  9. Horst MA, Coco AS. Observing the spread of common illnesses through a community: using Geographic Information Systems (GIS) for surveillance. *J Am Board Fam Med.* ;**23**(1):32-41 (2010).
  10. Eberhard J, Geissbuhler V, Petri E. [Surgical therapy of female urinary incontinence]. *Ther Umsch.*; **60**(5):282-8 (2003).
  11. Geissbuhler V, Eberhard J. [Experience with water births: a prospective longitudinal study of 9 years with almost 4,000 water births]. *Gynakol Geburtshilffliche Rundsch.* ;**43**(1):12-8 (2003).
  12. Laure B, Tiguemounine J, Picard A, Goga D. [Orbital abscess of dental origin]. *Rev Stomatol Chir Maxillofac.* ;**105**(2):125-9 (2004).
  13. Cluett ER, Nikodem VC, McCandlish RE, Burns EE. Immersion in water in pregnancy, labour and birth. *Cochrane Database Syst Rev.* (2):CD000111 (2004).
  14. Cluett ER, Pickering RM, Getliffe K, St George Saunders NJ. Randomised controlled trial of labouring in water compared with standard of augmentation for management of dystocia in first stage of labour. *BMJ.* **7**;328(7435):314 (2004).
  15. Pellantova S, Vebera Z, Pucek P. [Water delivery—a 5-year retrospective study]. *Ceska Gynekol.*; **68**(3):175-9 (2003).
  16. Direkvand Moghadam A, Jaafarpour M, Nouri M, Abbasi N. Effects of Oral Propranolol on Duration of Labor and Type of Delivery in Nulliparus Women with Prolonged Pregnancy. *The Iranian Journal of Obstetrics, Gynecology and Infertility.* ;**15**(1):42-7 (2012).
  17. Mitrani A, Oettinger M, Abinader EG, Sharf M, Klein A. Use of propranolol in dysfunctional labour. *Br J Obstet Gynaecol.* ;**82**(8):651-5 (1975).
  18. Sanchez-Ramos L, Quillen MJ, Kaunitz AM. Randomized trial of oxytocin alone and with propranolol in the management of dysfunctional labor. *Obstet Gynecol.* ;**88**(4 Pt 1):517-20 (1996).
  19. Adamsons K, de la Vega A, Santiago P. Reduction in the cesarean section rate in nulliparous patients after administration of intravenous propranolol. *P R Health Sci J.* ; **18**(1):5-8 (1999).
  20. Kashanian M, Fekrat M, Zarrin Z, Ansari NS. A comparison between the effect of oxytocin only and oxytocin plus propranolol on the labor (a double blind randomized trial). *J Obstet Gynaecol Res.* ; **34**(3):354-8 (2008).
  21. Palomaki O, Uotila J, Tammela O, Kaila T, Lavapuro M, Huhtala H, et al. A double blind, randomized trial on augmentation of labour with a combination of intravenous propranolol and oxytocin versus oxytocin only. *Eur J Obstet Gynecol Reprod Biol.* **1**;125(1):44-9 (2006).
  22. Schnabel A, Hahn N, Muellenbach R, Frambach T, Hoening A, Roewer N, et al. [Obstetric analgesia in German clinics. Remifentanyl as alternative to regional analgesia]. *Anaesthesist.* ;**60**(11):995-1001 (2011).
  23. Konefal H, Jaskot B, Czeszynska MB. [Pethidine for labor analgesia; monitoring of newborn heart rate, blood pressure and oxygen saturation during the first 24 hours after the delivery]. *Ginekol Pol.*; **83**(5):357-62 (2012).
  24. Keskin HL, Keskin EA, Avsar AF, Tabuk M, Caglar GS. Pethidine versus tramadol for pain relief during labor. *Int J Gynaecol Obstet.* ;**82**(1):11-6 (2003).
  25. Hawkins JM, Nambu M, Loren S. Asymmetric Lewis acid-catalyzed Diels-Alder reactions of alpha,beta-unsaturated ketones and

- alpha,beta-unsaturated acid chlorides. *Org Lett.* **13**;5(23):4293-5 (2003).
26. Terkawi AS, Wani TM, Al-Shuaibi KM, Tobias JD. Anesthetic considerations in Leigh disease: Case report and literature review. *Saudi J Anaesth.* ; **6**(2):181-5 (2012).
  27. El-Refaie TA, El-Said MM, Shoukry AA, Khafagy SM, El-Din AS, Badawy MM. Meperidine for uterine dystocia and its effect on duration of labor and neonatal acid-base status: a randomized clinical trial. *J Obstet Gynaecol Res.* ; **38**(2):383-9 (2012).
  28. Zhang G, Feng Y. [Effect of epidural analgesia on the duration of labor stages and delivery outcome]. *Nan Fang Yi Ke Da Xue Xue Bao.* **32**(8):1218-20 (2012).
  29. Sweed N, Sabry N, Azab T, Nour S. Regional versus IV analgesics in labor. *Minerva Med.* **102**(5):353-61 (2011).
  30. Leong EW, Sivanesaratnam V, Oh LL, Chan YK. Epidural analgesia in primigravidae in spontaneous labour at term: a prospective study. *J Obstet Gynaecol Res.* ; **26**(4):271-5 (2000).
  31. Ou X, Li B, Du H. [Clinical study: the effects of inhaling nitrous oxide for analgesia labor on pregnant women and fetus]. *Zhonghua Fu Chan Ke Za Zhi.* ; **36**(7):399-401 (2001).
  32. Su F, Wei X, Chen X, Hu Z, Xu H. [Clinical study on efficacy and safety of labor analgesia with inhalation of nitrous oxide in oxygen]. *Zhonghua Fu Chan Ke Za Zhi.* ; **37**(10):584-7 (2002).
  33. Rosen MA. Nitrous oxide for relief of labor pain: a systematic review. *Am J Obstet Gynecol.* ; **186**(5 Suppl Nature):S110-26 (2002).
  34. Faddy SC, Garlick SR. A systematic review of the safety of analgesia with 50% nitrous oxide: can lay responders use analgesic gases in the prehospital setting? *Emerg Med J.* 2005 Dec; **22**(12):901-8.
  35. Hawkins JD, Catalano RF. Assessing outcomes of prevention interventions. *Psychiatr Serv.* 2003 Nov; **54**(11):1548; author reply
  36. Farrell VM, Hill VL, Hawkins JB, Newman LM, Learned RE, Jr. Clinic for identifying and addressing polypharmacy. *Am J Health Syst Pharm.* 2003 Sep 15; **60**(18):1830, 4-5.
  37. Eslamian L, Marsoosi V, Pakneeyat Y. Increased intravenous fluid intake and the course of labor in nulliparous women. *Int J Gynaecol Obstetric.* **93**: 4 (2006).
  38. Kavitha A, Chacko KP, Thomas E, Rathore S, Christopher S, Biswas B, et al. A randomized controlled trial to study the effect of IV hydration on the duration of labor in nulliparous women. *Arch Gynecol Obstet.* **285**(2): 343-6 (2012).
  39. Hajiamini Z, Masoud SN, Ebadi A, Mahboubh A, Matin AA. Comparing the effects of ice massage and acupressure on labor pain reduction. *Complement Ther Clin Pract.* **18**(3): 169-72 (2012).
  40. Kimber L, McNabb M, Mc Court C, Haines A, Brocklehurst P. Massage or music for pain relief in labour: a pilot randomised placebo controlled trial. *Eur J Pain.* **12**(8):961-9 (2008).
  41. Liu YH, Chang MY, Chen CH. Effects of music therapy on labour pain and anxiety in Taiwanese first-time mothers. *J Clin Nurs.* **19**(7-8):1065-72 (2010).
  42. Chaichian S, Akhlaghi A, Roustafavi M. Experience of water birth delivery in Iran. *Arch Iran Med.* **12**(5):468-71 (2009).
  43. Taavoni S, Abdollahian S, Haghani H, Neysani L. Effect of birth ball usage on pain in the active phase of labor: a randomized controlled trial. *J Midwifery Womens Health.* **56**(2):137-40 (2011).
  44. Gau ML, Chang CY, Tian SH, Lin KC. Effects of birth ball exercise on pain and self-efficacy during childbirth: a randomised controlled trial in Taiwan. *Midwifery.* **27**(6): e293-300 (2011).
  45. Kashanian M, Shahali S. Effects of acupressure at the Sanyinjiao point (SP6) on the process of active phase of labor in nulliparas women. *J Matern Fetal Neonatal Med.* **15**: 1-4 (2009).
  46. Ma YX, Ma LX, Liu XL, Lv K, Wang D, Liu JP, et al. A comparative study on the immediate effects of electroacupuncture at Sanyinjiao (SP6), Xuanzhong (GB39) and a non-meridian point, on menstrual pain and uterine arterial blood flow, in primary dysmenorrhea patients. *Pain Med.* **11**(10): 1564-75 (2010).
  47. Zick SM, Wyatt GK, Murphy SL, Arnedt JT, Sen A, Harris RE. Acupressure for persistent cancer-related fatigue in breast cancer survivors (AcuCrft): a study protocol

- for a randomized controlled trial. *BMC Complement Altern Med.* **12**: 132 (2012).
48. Chang SB, Park YW, Cho JS, Lee MK, Lee BC, Lee SJ. [Differences of cesarean section rates according to San-Yin-Jiao(SP6) acupressure for women in labor]. *Taeahan Kanho Hakhoe Chi.* **34**(2): 324-32 (2004).
  49. Lee MK. [Effects of San-Yin-Jiao(SP6) acupressure on labor pain, delivery time in women during labor]. *Taeahan Kanho Hakhoe Chi.* **33**(6): 753-61 (2003).
  50. Hamidzadeh A, Shahpourian F, Orak RJ, Montazeri AS, Khosravi A. Effects of LI4 acupressure on labor pain in the first stage of labor. *J Midwifery Womens Health.* **57**(2): 133-8 (2012).
  51. Borup L, Wurlitzer W, Hedegaard M, Kesmodel US, Hvidman L. Acupuncture as pain relief during delivery: a randomized controlled trial. *Birth.* **36**(1): 5-12 (2009).
  52. Lowe NK. A review of factors associated with dystocia and cesarean section in nulliparous women. *J Midwifery Womens Health.* **52**(3): 216-28 (2007).
  53. Tranmer JE, Hodnett ED, Hannah ME, Stevens BJ. The effect of unrestricted oral carbohydrate intake on labor progress. *J Obstet Gynecol Neonatal Nurs.* **34**(3):319-28 (2005).
  54. Sleutel M, Golden SS. Fasting in labor: relic or requirement. *J Obstet Gynecol Neonatal Nurs.* **28**(5): 507-12 (1999).
  55. Hawkins JL. American Society of Anesthesiologists' Practice Guidelines for Obstetric Anesthesia: update 2006. *Int J Obstet Anesth.* **16**(2):103-5 (2007).
  56. Providing oral nutrition to women in labor. *J Midwifery Womens Health.* **53**(3): 276-83 (2008).
  57. O'Sullivan G, Liu B, Hart D, Seed P, Shennan A. Effect of food intake during labour on obstetric outcome: randomised controlled trial. *BMJ.* **338**: b784 (2009).
  58. Ip WY. Chinese husbands' presence during labour: a preliminary study in Hong Kong. *Int J Nurs Pract.* **6**(2): 89-96 (2000).
  59. Campbell BT, McVay MR, Lerer TJ, Lowe NJ, Smith SD, Kokoska ER. Ghosts in the machine: a multi-institutional comparison of laparoscopic and open pyloromyotomy. *J Pediatr Surg.* **42**(12): 2026-9 (2007).
  60. Cooper SE, Murawsky CM, Lowe N, Travers AA. Two modes of degradation of the tramtrack transcription factors by Siah homologues. *J Biol Chem.* **11**: 283(2):1076-83 (2008).
  61. Scott KD, Klaus PH, Klaus MH. The obstetrical and postpartum benefits of continuous support during childbirth. *J Womens Health Gen Based Med.* **8**(10): 1257-64 (1999).
  62. Moneta J, Okninska A, Wielgos M, Przybos A, Chrostowska J, Marianowski L. [The influence of water immersion on the course of labor]. *Ginekol Pol.* **72**(12): 1031-6 (2001).
  63. Grodzka M, Makowska P, Wielgos M, Przybos A, Chrostowska J, Marianowski L. [Water birth in the parturients' estimation]. *Ginekol Pol.* **72**(12): 1025-30 (2001).
  64. Wilkinson C, Enkin MW. Manual removal of placenta at caesarean section. *Cochrane Database Syst Rev.* **2**:CD000130 (2000).
  65. Wilkinson C, Enkin MW. Lateral tilt for caesarean section. *Cochrane Database Syst Rev.* **2**: CD000120 (2000).
  66. Wilkinson C, Enkin MW. Absorbable staples for uterine incision at caesarean section. *Cochrane Database Syst Rev.* **2**: CD000005 (2000).
  67. Jolliffe D, Farrington DP, Hawkins JD, Catalano RF, Hill KG, Kosterman R. Predictive, concurrent, prospective and retrospective validity of self-reported delinquency. *Crim Behav Ment Health.* **13**(3):179-97 (2003).