

Comparison between the Outcomes of Water Birth and Normal Vaginal Delivery

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ABSTRACT

Background & aim: Warm water immersion during labor is associated with relaxation and pain reduction for pregnant women. This method is not extensively used in Iran, given the fear of infection and other maternal/neonatal complications. Alternative methods are required to increase the safety of normal vaginal delivery. The purpose of this study was to compare maternal and neonatal outcomes, associated with water birth and normal vaginal delivery.

Methods: This analytical, cross-sectional study was performed on 43 water birth cases (study group) and 62 subjects with normal vaginal delivery (control group). Random sampling and consensus were applied for normal vaginal delivery and water birth groups, respectively. Data were collected in a data collection form, using hospital records and interviews with mothers. For data analysis, descriptive and analytical tests including t-test and Chi-square were carried out, using SPSS version 15.

Results: No significant difference was observed between the two groups in terms of labor and delivery complications; although three cases of complications during the second stage of labor and four cases of hospitalizations at birth were reported in the control group. The two groups were not significantly different in terms of hospitalization for the reason of neonatal period complications. Regarding maternal complications, there was a significant difference in the rate of episiotomy between the two groups ($P=0.032$). Postpartum hemorrhage was mostly observed in the control group, although the difference was not significant.

Conclusion: In this study, no significant difference was observed in terms of maternal or neonatal complications between the two groups. Therefore, it seems that water birth is a safe method, associated with improved pregnancy outcomes.

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Introduction

Immersion in warm water is one of the methods for reducing delivery pain. Use of warm water immersion during labor for women's relaxation and pain relief has a long history in clinical care. The modern use of water immersion for labor and birth began in 1970s by Igor Tjarkovsky, a Russian boat builder, who promoted water birth in Soviet Russia (1).

This method is widely practiced all over the world (2-4). A meticulous review of literature

shows that immersion in warm water has many benefits for pregnant women including relaxation, reduced medication use, and pain relief or reduction (5). Benefits of this method for mothers include the promotion of mothers' physical comfort, active participation in delivery process, and reduction of pain, labor duration, need for episiotomy, and rate of cesarean section.

Moreover, the neonatal advantages of this method include reduced risk of trauma, easier

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childbirth, immediate mother-child contact, and breastfeeding (2-11). According to a study by Odent, no infections were reported in mothers or newborns (12). However, previous research suggests the probability of spreading mother's skin, vaginal, perineal, and rectal microorganisms. Consequently, some scholars expressed their concerns regarding increased maternal and neonatal infections, choking, pneumonia, neonatal jaundice, and neonatal death due to respiratory problems (e.g., the possibility of drowning) (2, 3, 5, 6, 8, 10).

In Iranian randomized, controlled trials, a statistically significant reduction of labor pain (13, 14), need for analgesics (4, 14), need for episiotomy (4, 14), and active phase duration (4, 14) was reported in water birth groups, despite the increased perineal lacerations (4). In a case report study, Kassim et al. presented a case of neonatal respiratory distress after water birth of a full-term infant (10). Ghasemi et al. reported neonatal icter in three cases of water birth and one case of normal delivery; however, due to the limited number of cases, Chi-square test could not be performed by SPSS software (15).

Moreover, Mollamahmutoğlu et al. reported lower 1-minute Apgar scores in the water birth group (statistically significant) ($P < 0.001$) (16). In a study by Henderson et al., two cases of umbilical cord snap were reported and the majority of subjects had a second degree perineal tear with water birth. Schafer in an article discussed a case study in which a cord avulsed during water birth (17, 18).

Unfortunately, in spite of the application of this method in some parts of the world, the main question about the safety of water birth remains unanswered; therefore, more convincing evidence is required. To prevent the associated risks, many researchers have determined specific criteria for performing water birth. In fact, pregnant women, who are in the active phase of delivery with preferably intact fetal membranes, are at lower risks (2, 5, 11, 19).

In addition to water birth, there are some other non-pharmacological methods for pain reduction. Women's satisfaction with active pain control, support by families and healthcare advisors, ease of movement, and changing positions are among the advantages of these methods. At present, these modalities have

attracted the attention of women who look for simple, effective, and economical methods, which result in no side-effects or complications (2).

Water birth has been performed in a few Iranian hospitals in recent years, although this method is less practiced in Iran. This method is unknown to a majority of pregnant women, given the limited understanding and experience of obstetricians, gynecologists, and midwives in performing water birth. With regard to the high rate of cesarean section in Iran, water birth may increase pregnant women's satisfaction with normal vaginal delivery; consequently, the rate of cesarean delivery, without any specified indications, reduces.

Due to the limited number of studies in Iran, the purpose of the present research was to compare maternal and neonatal outcomes (from birth to 28 days after birth) of water birth and normal vaginal delivery in 2010. The findings of this study can increase women's awareness about water birth and encourage the application of this method among obstetricians.

Materials and Methods

In this analytical, cross-sectional study, all water birth cases (43 cases) were allocated to the study group and subjects with normal vaginal delivery were included in the control group (62 cases). The subjects were randomly selected from Kermanshah Motazedi Hospital in years 2009 and 2010 in Iran.

The inclusion criteria for pregnant women were as follows: 1) low-risk pregnancy; 2) having a term, live, single fetus; 3) cephalic presentation; 4) active phase during hospitalization (at least 4 cm dilatation), and 5) intact fetal membranes. If a mother did not meet these criteria, she was excluded from the study. The two groups were matched in terms of variables such as age, parity and dilatation.

Based on the regulations of Motazedi Hospital, volunteers for water birth had to read and sign consent forms, besides meeting the above-mentioned criteria. The written consents were completed and signed in the presence of women's spouses.

After taking a shower, the subject entered a warm water tub. Fetal heart rate was controlled using a waterproof Sony probe (Summit Doppler 150R, USA) every 30 minutes.

Moreover, water temperature was measured every hour (maintained at 36-37 °C). The room was adequately ventilated and beverage was provided for women to avoid dehydration. A midwife attended the process during all stages of labor; thus, the subjects were provided with routine delivery care.

Data collection tools included a form consisting of four sections: demographic data (5 items), obstetric information (7 items), information related to delivery process until discharge from the hospital (12 items), and data related to maternal and neonatal outcomes one month after delivery (18 items).

Permission was obtained from the authorities of Motazedi Hospital. We referred to the archive section of the hospital and collected all records associated with water birth, using a specific code (water birth). For the control group, with regard to matched variables such as age, parity and dilatation, 62 cases with normal vaginal delivery (out of water) were selected.

Demographic, obstetric, and delivery-related data were collected from hospital records. Data associated with maternal and neonatal outcomes were gathered via interviews with mothers on the phone. In order to determine neonatal outcomes, hospital records related to delivery, nursing care, and postpartum conditions were collected. If a newborn was admitted to Special Nursery Care Ward or Neonatal Intensive Care Unit (NICU), the records were gathered.

Data related to maternal outcomes included the duration of stages of labor, use of analgesics, oxytocin administration, mode of delivery, postpartum perineal condition, postpartum hemorrhage, and puerperal morbidities (e.g., infection and hemorrhage). Neonatal outcomes included 1- and 5-minute Apgar scores, need for oxygen after birth, neonatal admission, and neonatal morbidities, e.g., infection.

Statistical tests including t-test and Chi-square were performed, using SPSS version 16. P-value less than 0.05 was considered statistically significant.

Results

The average age of study and control groups was 26±6.13 and 26±7.06 years, respectively (P=0.551). The majority of women (51.5%) in both groups were 21-35 years old. In the study

group, 34.9% of women had high school diploma or higher education, while 58.1% of women in the control group had primary level education. There was a significant difference between the two groups in terms of education (P=0.037). Approximately 97.7% of the study group and 100% of the control group were housewives. Also, 88.4% of the study group and 62.9% of the control group were living in urban areas.

Participation in pregnancy preparation classes was not significantly different between the groups (23.3% of the study group and 14.5% of the control group). There was no significant difference between the two groups in terms of obstetric history, parity or abortion (Table 1). Regarding cervical dilatation during hospitalization, 88.2% of both groups had 7 cm (and more) dilatation; no significant difference was observed between the two groups (P=0.690).

Complications during all four stages of labor were not significant in the groups (P=0.590). However, there were 3 cases of assisted delivery in the control group. Neonatal complications due to childbirth (up to one month after delivery) (Table 2) and other neonatal characteristics such as gender (P=0.058), weight (P=0.738) and head circumference (P=0.069) were not significantly different between the two groups.

There was no difference in 1- and 5-minute Apgar scores between the two groups (P=0.499 and P=0.456, respectively). In the control group, there were 2 cases with 1-minute Apgar scores of 6 and 7; in the water birth group, one case had a score of eight.

Table 1. Frequency (percentage) of pregnancy, parity, and abortion in study and control groups

Obstetric history	Study (n=42) N (%)	Control (n=61) N (%)	Chi-square
Parity			
1-2	29(67.4)	43(69.4)	X ² = 1.269 P=0.530
3-4	13(30.2)	15(24.2)	
4-9	1(2.3)	4(6.5)	
Number of births			
0	18(41.9)	18(29)	X ² =2.052 P=0.358
1-2	21(48.4)	35(56.5)	
3-6	4(9.3)	9(14.5)	
Abortion			
0	39(90.7)	56(90.3)	X ² = 2.004 P=0.613
1-2	4(9.3)	6(9.7)	

Table 2. Comparison of neonatal complications between the two groups

Complication	Study (n=42) N (%)	Control (n=61) N (%)	Chi-square
Oxygen therapy after birth	2 (4.7)	3(4.8)	X ² =2.002 P=0.669
Admission after birth	0.0(0.0)	4 (6.5)	X ² =2.884 P=0.117
Admission in neonatal period	2 (4.7)	1 (1.6)	X ² =2.844 P=0.364
Complications in neonatal period	2 (4.7)	1 (1.6)	X ² =2.844 P=0.364

Table 3. Comparison of maternal outcomes between study and control groups

Maternal outcomes	Study (n=42) N (%0)	Control (n=61) N (%)	OR ^a (CI=95%)	Chi-square
Postpartum hemorrhage	1(2.3)	6(9.7)	0.24 (0.03,1.925)	X ² =2.206 P=0.138
Need for pain relief	1(2.3)	7(11.3)	0.206 (0.026,1.614)	X ² =2.899 P= 0.088
Need for augmentation	0.0(0.0)	4(6.5)	0.176 (0.009,3.24)	X ² =2.884 P=0.117
Puerperal infection	1(2.3)	1(1.6)	1.44 (0.092,22.42)	X ² =2.069 P= 0.654

a=odds ratio

Table 4. Comparison of the mean duration of delivery stages between study and control groups

Mean duration (min)	Study (n=42) Mean±SD	Control (n=61) Mean±SD	Independent sample test
Stage one	86.9±59.2	75.7±69.1	t =.761 p= 0.635
Stage two	13.3±16.1	11.3±14.0	t =.675 p= 0.051
Stage three	5.1±1.5	4.8±.51	t=1.403 p= 0.235

Considering maternal outcomes, there were no significant differences in need for delivery induction, need for pain reduction, postpartum hemorrhage or maternal infections (Table 3). The difference in the frequency of performing episiotomy was significant between the groups (14% of the study group and 32.3% of the control group) (P=0.032).

Moreover, the difference in terms of first degree tear (23.3% of the study group and 6.5% of the control group) was significant (P=0.032). Hemoglobin level after birth was recorded in only 42 cases; the mean was 11.34±4.11 in the study group and 11.14±1.14 in the control group, which indicated no significant difference (P=0.558). There was no significant difference in maternal age, delivery-associated complications, and average duration of delivery between the groups (Table 4).

Discussion

There is a great deal of controversy regarding water birth among obstetricians and gynecologists, given the possible risks for neonatal health. In this study, water birth and

control groups were not significantly different in terms of neonatal outcomes.

One- and five-minute Apgar scores less than 8 were not significantly different between the groups. Similarly, in many previous studies, no significant difference was observed in Apgar scores of the groups (5, 8, 19, 20-22). It seems that selecting women with low-risk pregnancies in these studies led to obtaining suitable neonatal outcomes. In fact, no neonatal mortality was reported in any of the groups. In Byard's study, only one case of death was reported due to sepsis (as a result of pseudomonas). It seems that mothers with 42 weeks of gestation were not good candidates for water birth (8).

Zanetti reported 5 cases of conjunctivitis in each of the study and control groups. Moreover, two cases of meconium aspiration and one case of sepsis were reported in the control group (7). Woodward and Pllantova in two different studies indicated no difference in the rate of neonatal complications or infection between the two groups (5, 23). In fact, rate of neonatal infection has been reported to be low in several previous studies (19, 21, 22, 24); this may be

due to careful criteria selection, hygiene, and care services in these studies.

There was no significant difference regarding NICU admission between the two groups in this study. Two cases of neonatal admission were reported in the water birth group; first one was due to neonatal jaundice, accompanied by spina bifida, and the second one was related to respiratory distress.

No significant differences have been reported in terms of admission in other studies (5, 20, 21). In Otighbah's study, two neonatal admissions were reported in cases with water birth; both infants belonged to the control group. True knot cord and non-recognition of complex presentation were the reasons for admission; however, these conditions could occur in other modes of delivery, as well (11). There are concerns about the increased risk of neonatal jaundice. The reason may be the impact of warm water on umbilical cord blood flow after birth. However, no significant differences have been observed in newborns' hemoglobin level after delivery (5).

In the present study, the only significant difference in maternal outcomes was higher rate of episiotomy in the control group. Incidence of first and second degree tears was higher in the study group; however, the difference was insignificant. In some studies, rate of episiotomy in control groups were significantly higher (7, 11, 17). Results of similar studies indicated the effect of warm water on perineal expansion. Higher incidence of slight tear in the study group was due to lack of perineal control and application of hands-off method in water birth, compared to other methods. Furthermore, shorter length of hospital stay in the water birth group in our research, compared to other studies, may be one of the reasons for the higher incidence of perineal tear.

No significant difference was observed in puerperal infection in this study. There was only one case of admission after water birth due to fever (16 days after delivery). Results of urine and blood cultures were negative and the patient was discharged after antibiotic therapy. Zanetti reported two cases of urinary infection and one case of endometritis in one of the control groups and one case of respiratory infection in the study group (without any significant differences) (7). In

addition, in previous studies, no significant difference was found in postpartum maternal infection between control and water birth groups (19, 21, 22, 24). In fact, two conditions can prevent the development of infection: safe and intact membranes and length of stay in water (maximum of 2 hours).

Postpartum hemorrhage was more frequent in the control group, although the difference with water birth group was insignificant. No significant differences were observed in postpartum hemorrhage between water birth and control groups in other studies (11, 23). This may be due to lack of intervention, natural process of delivery, and lack of need for oxytocin administration or assisted vaginal delivery in water birth.

In the present study, three cases of assisted vaginal delivery were reported in the control group. Cluett and Woodward did not observe any significant differences in terms of delivery mode, assisted vaginal delivery, or need for cesarean section between water birth and control groups (3, 5). However, the need for assisted vaginal delivery in the study group was significantly lower in the study by Rush (24). Obviously, lack of medical interventions in water birth decreases the need for cesarean section and assisted vaginal delivery.

In the current study, need for augmentation was only reported in the control group, although the difference was not statistically different. Cluett found no differences in the need for amniotomy or oxytocin infusion between the two groups (3). Chaychian and Zanetti reported significant differences in need for augmentation in the control group (4, 7).

The effect of warm water on slowing labor and need for augmentation is a major issue. Based on the results of the above-mentioned studies, it seems that warm water is effective for relaxation and blood circulation for natural oxytocin secretion.

In the assessment of labor duration, no significant difference was found in different stages of labor. Durations of stages of delivery in the water birth group were shorter in other studies, while no difference was observed with some other studies (4, 7, 11, 19, 23). So far, no study has reported longer durations in cases

with water birth; this can refuse the inverse effect of warm water on contractions.

The control group was in higher demand for pain relief in this study (without a significant difference from the study group). As Chaychian, Otighbah, and Zanetti indicated, need for pain relief by opium, anti-spasmodic medicines, and analgesics was significantly less in the study group (4, 7, 11). In a meta-analysis study by Cluett, the need for narcotics was not significantly different between the groups in four clinical trials, while in 6 other studies, need for pain relief through spinal/epidural analgesia and cervical block was significant (3). Impact of warm water, selection of delivery mode, level of awareness, and pregnant women's tendency toward water birth are probable effective factors for decreasing the need for pain relief in this method.

One limitation of our study was the small size of water birth group, despite the inclusion of all water birth cases. Another limitation was related to the nature of this study (retrospective, observational study); in fact, we only had access to hospital records.

Due to the limited published resources and articles about water birth (or water immersion), specially in Iran (4 randomized, clinical trials with 235 water birth cases), this study can contribute to the documented data about alternative modes of delivery. The obtained results can be of great help to researchers and women asking for other childbirth methods. We need to satisfy women's needs and respect their rights. For this purpose, further randomized, clinical research needs to be performed.

Conclusion

No maternal or neonatal complications were observed in either study or control group. This can indicate the safety and advantages of water birth. Appropriate selection of water birth candidates is the main factor for water birth safety. Evidence suggests that application of this method during the first stage of labor for low-risk pregnant women reduces the use of analgesics and duration of the first stage of labor.

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Conflicts of Interest

The authors declare no conflicts of interest.

References

1. Garland D, Jones KC. Waterbirths: supporting practice with clinical audit. *MIDIRS Midwifery Digest*. 2000; 10(3):333-336.
2. Simkin PP, Ohara M. Nonpharmacologic relief of pain during labour: systematic reviews of five methods. *American Gynecological Society*. 2002; 186: 131-159.
3. Clutte E, Burns E. Immersion in water in labor and birth. *Cochrane Database Systematic Review*. 2012; 15(2): CD000111.
4. Chaichian S, Akhloghi A, Rousta F, Safavi M. Experience of water birth delivery in Iran. *Archives of Iranian Medicine*. 2009; 12(5):468-471.
5. Woodward J, Kelly SM. A pilot study for a randomised controlled trial of waterbirth versus landbirth. *British Journal of Obstetrics and Gynaecology*. 2004; 111(6):537-547.
6. Pinettie MG, Wax J, Wilson E. The risk of underwater birth. *American Journal of Obstetrics and Gynecology*. 2004; 190(5): 1211-1215.
7. Zanetti DRA, Tschudin S, Zhang XY, Holzgreve W, Lapaire O, Hosil I. Maternal and neonatal infections and obstetrical outcome in water birth. *European Journal of Obstetrics, Gynecology, and Reproductive Biology*. 2007; 134(1):37-43.
8. Byard RW, Zuccollo JM. Forensic Issues in case of waterbirth fatalities. *The American Journal of Forensic Medicine and pathology*. 2010; 31(3): 258-260.
9. Meyer SL, Weible CM, Woeber K. Perceptions and practice of waterbirth: a survey of Georgia Midwives. *Journal of Midwifery & Women's Health*. 2010; 55(1):55-59.
10. Kassim Z, Sellars M, Greenough A. Under water birth and neonatal respiratory distress. *British Medical Journal*. 2005; 330(7505):1447-1448.
11. Otighbah CM, Dhanjal MK, Harmsworth G, Chard T. A retrospective comparison of waterbirth and conventional vaginal deliveries. *European Journal of Obstetrics & Gynecology and Reproductive Biology*. 2000; 91(1):15-20.
12. Odent M. Birth under water. *Lancet*. 1983; 322(8365-8366):1476-1477.
13. Shahpourian F, Kiani K, Sedighian H, Hosseini F.

- Effect of Water Birth on Labor pain During Active Phase of Labor. *Journal of Iran University of Medical Sciences*. 2008; 14(57): 101-111. [Persian]
14. Akbari S, Rashidi N, Changavi F, Janani F, Tarrahi MJ. The effect of water birth on the duration of labor and pain level in comparison with land birth. *Yafte Journal of Medical Sciences*. 2008; 10(3):39-46. [Persian]
 15. Ghasemi M, Tara F, Ashraf H. Maternal-Fetal and Neonatal Complications of Water-Birth Compared with Conventional Delivery. *The Iranian Journal of Obstetrics, Gynecology and infertility*. 2013; 16(70):9-15. [Persian]
 16. Mollamahmutoğlu L, Moraloğlu O, Özyer S, Akin Su F, Karayalçın R, Hançerlioğlu N, et al. The effects of immersion in water on labor, birth and newborn and comparison with epidural analgesia and conventional vaginal delivery. *Journal of the Turkish German Gynecological Association*. 2012; 13(1): 45-49.
 17. Henderson J, Burns EE, Regalia AL, Casarico G, Boulton MG, Smith LA. Labouring women who used a birthing pool in obstetric units in Italy: prospective observational study. *BMC Pregnancy and Childbirth*. 2014; 14:17.
 18. Schafer R. Umbilical cord avulsion in waterbirth. *Journal of Midwifery Womens Health*. 2014; 59(1):91-94.
 19. Schorn MN, McAllister JL, Blanco JD. Water immersion and the effect on labor. *Journal of Nurse Midwifery*. 1993; 38(6):336-342.
 20. Ohlsson G, Buchhave P, Leandersson U, Norstrom L, Kydhstrom H, Sjolín I. Warm tub bathing during labor:maternal and neonatal effects. *Acta obstetricia et gynecologica Scandinavica*. 2001; 80(4): 311-314.
 21. Eckert K, Tumbull D, MacLennan A. Immersion in water in the first stage of labor: a randomized controlled trial. *Birth*. 2001; 28(2):84-93.
 22. Cammu H, Clasen K, Vanwettere L, Derde MP. To bath or not to bath during the first stage of labor. *Acta Obstetricia et Gynecologica Scandinavica*. 1994; 73(6):468-472.
 23. Pellantova S, Vebera Z, Pucek P. Water delivery-a 5-year retrospective study. *Ceská gynecologie*. 2003; 88(3):175-179.
 24. Rush J, Lambert K, Loosley-Millman M, Hutchison B, Enkin M. The effect of whirlpools baths in labor: a randomized controlled trial. *Birth*. 1996; 23(3):136-143.