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Obstetricians and Gynecologists  
WOMEN'S HEALTH CARE PHYSICIANS

## CLINICAL REPORT

## Immersion in Water During Labor and Delivery

## abstract

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Immersion in water has been suggested as a beneficial alternative for labor, delivery, or both and over the past decades has gained popularity in many parts of the world. Immersion in water during the first stage of labor may be associated with decreased pain or use of anesthesia and decreased duration of labor. However, there is no evidence that immersion in water during the first stage of labor otherwise improves perinatal outcomes, and it should not prevent or inhibit other elements of care. The safety and efficacy of immersion in water during the second stage of labor have not been established, and immersion in water during the second stage of labor has not been associated with maternal or fetal benefit. Given these facts and case reports of rare but serious adverse effects in the newborn, the practice of immersion in the second stage of labor (underwater delivery) should be considered an experimental procedure that only should be performed within the context of an appropriately designed clinical trial with informed consent. Facilities that plan to offer immersion in the first stage of labor need to establish rigorous protocols for candidate selection, maintenance and cleaning of tubs and immersion pools, infection control procedures, monitoring of mothers and fetuses at appropriate intervals while immersed, and immediately and safely moving women out of the tubs if maternal or fetal concerns develop. *Pediatrics* 2014;133:758–761

## INTRODUCTION

Immersion in water has been suggested as a beneficial alternative for labor, delivery, or both and over the past decades has gained popularity in many parts of world.<sup>1–4</sup> Approximately 1% of births in the United Kingdom include at least a period of immersion,<sup>5</sup> and a 2006 joint statement from the Royal College of Obstetricians and Gynecologists and Royal College of Midwives supported immersion in water during labor for healthy women with uncomplicated pregnancies and stated that to achieve best practice with water birth, it is necessary for organizations to provide systems and structure to support this service.<sup>6</sup> The prevalence of this practice in the United States is unknown, because such data are not collected as part of

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## KEY WORDS

labor, delivery, water birth, immersion, perinatal care

## ABBREVIATIONS

CI—confidence interval

RCT—randomized controlled trial

RR—risk ratio

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The recommendations in this report do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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vital statistics. A 2001 survey found that at least 143 US birthing centers offered immersion in water during labor, delivery, or both.<sup>7</sup> A 2005 commentary by the Committee on Fetus and Newborn of the American Academy of Pediatrics did not endorse underwater birth.<sup>8</sup> This clinical report reviews the literature concerning the reported risks and benefits of immersion in water during labor and delivery.

### EVIDENCE REGARDING IMMERSION IN WATER DURING LABOR AND DELIVERY

Before examining available evidence concerning immersion during childbirth, it is important to recognize the limitations of studies and evidence in this area. Most published articles that recommend underwater births are retrospective reviews of a single center experience, observational studies using historical controls, or personal opinions and testimonials, often in publications that are not peer reviewed.<sup>1–3,9–11</sup> Also of importance, there are no basic science studies in animals or humans to confirm the physiologic mechanisms proposed to underlie the reported benefits of underwater births.

Other issues, in addition to the nature and design of studies, complicate the interpretation of the published findings, including the absence of a uniform definition of the exposure itself. Often, immersion is referred to as “underwater birth,” but effects and outcomes may be different for immersion during the first stage and second stage of labor. This clinical report, accordingly, avoids the term underwater birth and makes an effort to distinguish data and outcomes related separately to immersion in the first stage and second stage of labor. Not all studies, however, distinguish when in the course of labor and delivery immersion was undertaken.

Outcomes indicating safety or risk in association with immersion at 1 stage may not translate into equivalent outcomes at a different stage of labor; specifically, safety during labor may not translate into safety during delivery. In addition to this important limitation, immersion therapies have varied between studies in the duration of immersion, the depth of the bath or pool, the temperature of the water, and whether or not agitation (jets or whirlpool) was used. In considering the evaluation of outcomes, it is important to note that health care providers involved in providing or studying immersion therapy are not masked to either the treatment or outcomes, and especially in nonrandomized studies, outcomes may be influenced by differences in the environment attending a particular choice of delivery. Finally, most trials of immersion therapy are small, which limits their power to detect rare outcomes.

Randomized controlled trials (RCTs) would be ideal to address many of the aforementioned concerns. A 2009 Cochrane review identified 12 relevant and appropriately designed RCTs of immersion during labor, which involved 3243 women. Nine of these trials involved immersion during the first stage of labor alone (1 of 9 trials compared early versus later immersion during the first stage), 2 trials involved first stage and second stage of labor, and 1 trial involved comparing only the second stage of labor with the controls. Even among these RCTs, however, some of the aforementioned limitations remain, including concerns about power and how the absence of blinding might affect definition of outcomes. The systematic review also noted that most trials have small sample sizes and, thus, a high risk of bias. These factors limit comparison across trials and the reliability and validity of the trial findings.<sup>5</sup>

### PROPOSED BENEFITS FROM IMMERSION DURING LABOR AND DELIVERY

There have been claims concerning the positive effects of immersion during labor.<sup>12–14</sup> Immersion is known to affect maternal cardiovascular physiology as hydrostatic pressure promotes increased venous return and mobilization of extravascular fluid and edema.<sup>15,16</sup> In part as a result of these effects, proponents of underwater immersion during labor and delivery argue that there are a variety of benefits to such treatment, including a decrease in perinatal pain, a greater sense of well-being and control, and a decreased rate of perineal trauma. Some advocates argue that immersion during labor and delivery decreases maternal stress and stress-associated hormone levels. It could also potentially benefit the newborn infant with a gentler transition from the in utero to ex utero environment.<sup>1–7</sup>

Individual retrospective analyses and case series argue in support of 1 or more of the benefits listed previously, but among RCTs studying immersion in the first stage of labor that were included in the 2009 Cochrane systematic review,<sup>5</sup> results were inconsistent. Although many individual RCTs reported no benefit, the combined data indicated that immersion during the first stage of labor was associated with decreased use of epidural, spinal, or paracervical analgesia among those allocated to water immersion compared with controls (478/1254 vs 529/1245; risk ratio [RR] 0.90; 95% confidence interval [CI], 0.82 to 0.99; 6 trials). There was a reduction in duration of the first stage of labor (mean difference –32.4 minutes; 95% CI, –58.7 to –6.13). However, considering each of these effects (particularly the latter), it is difficult to know how factors other than immersion, such as the structure of care (including health

care providers and timing and frequency of examinations) affected outcome. Furthermore, there were no differences in perineal trauma or tears (RR, 1.16; 95% CI, 0.99 to 1.35; 5 trials) or need for either assisted vaginal deliveries (RR, 0.86; 95% CI, 0.71 to 1.05; 7 trials) or cesarean delivery (RR, 1.21; 95% CI, 0.87 to 1.65; 8 trials) between those allocated to the immersion and control arms in the meta-analysis results.

Among the 2 trials that reported outcomes from immersion in the second stage of labor included in this systematic review,<sup>5</sup> the only difference in maternal outcomes from immersion during the second stage was an improvement in satisfaction among those allocated to immersion in 1 trial. None of the individual trials or the Cochrane systematic review<sup>5</sup> has reported any benefit to the newborn infant from maternal immersion during labor or delivery.

## REPORTED COMPLICATIONS FROM IMMERSION DURING LABOR AND DELIVERY

Individual case reports and case series have noted complications for the mother and the neonate<sup>17–25</sup> that highlight potential risks from immersion during labor and delivery. Because the denominators are not uniformly reported, the exact incidence of complications is difficult to assess. Some of the reported concerns include higher risk of maternal and neonatal infections, particularly with ruptured membranes; difficulties in neonatal thermoregulation; umbilical cord avulsion and umbilical cord rupture while the newborn infant is lifted or maneuvered through and from the underwater pool at delivery, which leads to serious hemorrhage and shock; respiratory distress and hyponatremia that results from tub-water aspiration (drowning or near drowning); and seizures and perinatal asphyxia.<sup>25</sup>

Among this list of complications, given its potential seriousness, the possibility of a neonate aspirating water during birth while immersed has been the focus of understandable concern. Alerdice et al<sup>26</sup> summarized case reports of adverse neonatal outcomes, including drownings and near drownings. The case reports included immersion births in hospitals and at home. Subsequently, a study by Byard and Zuccollo reported 4 cases of severe respiratory distress in neonates after water birth, 1 of whom died of overwhelming sepsis from *Pseudomonas aeruginosa*.<sup>19</sup> Although it has been claimed that neonates delivered into the water do not breathe, gasp, or swallow water because of the protective “diving reflex,” studies in experimental animals and a vast body of literature from meconium aspiration syndrome demonstrate that, in compromised fetuses and neonates, the diving reflex is overridden,<sup>27,28</sup> which leads potentially to gasping and aspiration of the surrounding fluid.

Morbidity and mortality, including respiratory complications, suggested in case series were not seen in the 2009 Cochrane synthesis of RCTs, which concluded that “there is no evidence of increased adverse effects to the fetus/neonate or woman from laboring in water or water birth.”<sup>5</sup> This conclusion, however, should be tempered by several concerns, including the issue of the power of the sample size to identify rare but potentially serious outcomes. In this regard, in an RCT<sup>29</sup> excluded from the Cochrane analysis (because included labors all involved dystocia), 12% of neonates who were delivered in the immersion arm required admission to the NICU, as compared with none in the group delivered without immersion.

## SUMMARY

Immersion in water during the first stage of labor may be appealing to

some and may be associated with decreased pain or use of anesthesia and decreased duration of labor; however, there is no evidence that immersion during the first stage of labor otherwise improves perinatal outcomes. Immersion therapy during the first stage of labor should not prevent or inhibit other elements of care, including appropriate maternal and fetal monitoring.

In contrast, the safety and efficacy of immersion in water during the second stage of labor have not been established, and immersion in water during the second stage of labor has not been associated with maternal or fetal benefit. Given these facts and case reports of rare but serious adverse effects in the newborn, the practice of immersion in the second stage of labor (underwater delivery) should be considered an experimental procedure that only should be performed within the context of an appropriately designed clinical trial with informed consent.

Although not the focus of specific trials, facilities that plan to offer immersion in the first stage of labor need to establish rigorous protocols for candidate selection, maintenance and cleaning of tubs and immersion pools, infection control procedures, monitoring of mothers and fetuses at appropriate intervals while immersed, and protocols for moving women from tubs if urgent maternal or fetal concerns develop.

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\*The views expressed in this document are not necessarily those of the Eunice Kennedy Shriver National Institute of Child Health and Human Development, the National Institutes of Health, or the Department of Health and Human Services.

## REFERENCES

- Geissbühler V, Eberhard J. Waterbirths: a comparative study. A prospective study on more than 2,000 waterbirths. *Fetal Diagn Ther*. 2000;15(5):291–300
- Geissbuehler V, Stein S, Eberhard J. Waterbirths compared with landbirths: an observational study of nine years. *J Perinat Med*. 2004;32(4):308–314
- Woodward J, Kelly SM. A pilot study for a randomised controlled trial of waterbirth versus land birth. *BJOG*. 2004;111(6):537–545
- Chaichian S, Akhlaghi A, Rousta F, Safavi M. Experience of water birth delivery in Iran. *Arch Iran Med*. 2009;12(5):468–471
- Cluett ER, Burns E. Immersion in water in labour and birth. *Cochrane Database Syst Rev*. 2009;(2):CD000111
- Immersion in Water During Labour and Birth. RCOG/Royal College of Midwives Joint Statement No. 1. London, England: Royal College of Obstetricians and Gynaecologists, Royal College of Midwives; 2006. Available at: [www.rcog.org.uk/womens-health/clinical-guidance/immersion-water-during-labour-and-birth](http://www.rcog.org.uk/womens-health/clinical-guidance/immersion-water-during-labour-and-birth). Accessed February 6, 2013
- Mackey MM. Use of water in labor and birth. *Clin Obstet Gynecol*. 2001;44(4):733–749
- Batton DG, Blackmon LR, Adamkin DH, et al; Committee on Fetus and Newborn, 2004–2005. Underwater births [commentary]. *Pediatrics*. 2005;115(5):1413–1414
- Enning C. How to support the autonomy of mother/baby in second stage of waterbirth. *Midwifery Today Int Midwife*. 2011;(98):40–41
- Maude RM, Foureur MJ. It's beyond water: stories of women's experience of using water for labour and birth. *Women Birth*. 2007;20(1):17–24
- Moore M. How to make a portable water-birth tub. *Midwifery Today Int Midwife*. 2002;(61):38–39
- Edlich RF, Towler MA, Goitz RJ, et al. Bio-engineering principles of hydrotherapy. *J Burn Care Rehabil*. 1987;8(6):580–584
- Ginesi L, Niecierowicz R. Neuroendocrinology and birth 2: the role of oxytocin. *Br J Midwifery*. 1998;6(12):791–796
- Garland D, Jones KC. Waterbirth: supporting practice with clinical audit. *MIDIRS Midwifery Dig*. 2000;10(3):333–336
- Katz VL, Rozas L, Ryder R, Cefalo RC. Effect of daily immersion on the edema of pregnancy. *Am J Perinatol*. 1992;9(4):225–227
- Katz VL, McMurray R, Berry MJ, Cefalo RC, Bowman C. Renal responses to immersion and exercise in pregnancy. *Am J Perinatol*. 1990;7(2):118–121
- Bowden K, Kessler D, Pinette M, Wilson E. Underwater birth: missing the evidence or missing the point? [published correction appears in *Pediatrics*. 2004;113:433] *Pediatrics*. 2003;112(4):972–973
- Pinette MG, Wax J, Wilson E. The risks of underwater birth. *Am J Obstet Gynecol*. 2004;190(5):1211–1215
- Byard RW, Zuccollo JM. Forensic issues in cases of water birth fatalities. *Am J Forensic Med Pathol*. 2010;31(3):258–260
- Eckert K, Turnbull D, MacLennan A. Immersion in water in the first stage of labor: a randomized controlled trial. *Birth*. 2001;28(2):84–93
- Franzin L, Cabodi D, Scolfaro C, Gioannini P. Microbiological investigations on a nosocomial case of *Legionella pneumophila* pneumonia associated with water birth and review of neonatal cases. *Infez Med*. 2004;12(1):69–75
- Gilbert R. Water birth—a near-drowning experience. *Pediatrics*. 2002;110(2 pt 1):409
- Kassim Z, Sellars M, Greenough A. Underwater birth and neonatal respiratory distress. *BMJ*. 2005;330(7499):1071–1072
- Mottola MF, Fitzgerald HM, Wilson NC, Taylor AW. Effect of water temperature on exercise-induced maternal hyperthermia on fetal development in rats. *Int J Sports Med*. 1993;14(5):248–251
- Nguyen S, Kuschel C, Teele R, Spooner C. Water birth—a near-drowning experience. *Pediatrics*. 2002;110(2 pt 1):411–413
- Alderdice F, Renfrew M, Marchant S, et al. Labour and birth in water in England and Wales. *BMJ*. 1995;310(6983):837
- Johnson P. Birth under water—to breathe or not to breathe. *Br J Obstet Gynaecol*. 1996;103(3):202–208
- Cammu H, Clasen K, Van Wettere L, Derde MP. “To bathe or not to bathe” during the first stage of labor. *Acta Obstet Gynecol Scand*. 1994;73(6):468–472
- 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*. 2004;328(7435):314

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