



Evidence on the Safety of Waterbirth

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In April 2014, waterbirth—an alternative method for pain relief in which a mother gives birth in a tub of warm water—made [national headlines](#). The event that pushed **water birth safety** into the spotlight was a joint [Opinion Statement](#) from the American Congress of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics (AAP), denouncing the practice.

In their opinion statement, **ACOG and the AAP firmly admonished that waterbirth should be considered an experimental practice** that should only occur in the context of a clinical research study. Their conclusion, which echoed a previous AAP Opinion Statement from [2005](#), was based on their opinion that water birth does not have any benefits and may pose dangers for the newborn.

In response, the [American College of Nurse Midwives \(ACNM\)](#), (Midwives 2014) the [American Association of Birth Centers \(AABC\)](#), and the [Royal College of Midwives \(RCM\)](#) all released statements **endorsing waterbirth as a safe, evidence-based option**. Meanwhile, the AABC released [preliminary data from nearly 4,000 waterbirths](#) that occurred in birth centers all over the U.S., supporting water birth as safe for mothers and infants.

Despite the response from midwifery organizations and the AABC, hospitals all over the U.S. began suspending or shutting down their waterbirth programs. At St. Elizabeth's Regional Medical Center in Lincoln, Nebraska, mothers and families organized rallies and started a [change.org petition](#) to bring waterbirth back.

All of this controversy left us with these questions— **Is the ACOG/AAP statement based on a complete and accurate review of the literature? What is the evidence on waterbirth? Is it safe? Does it have any potential benefits or harms for mothers and infants?** These are the questions we will address in the Evidence Based Birth article on the evidence on waterbirth.

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What is water birth?

During **water immersion in labor**, women get into a tub or pool of warm water during the first stage of labor, before the baby is born.

In a **waterbirth**, the mother remains in the water during the pushing phase and actual birth of the baby. The baby is then brought to the surface of the water after it is born ([Nutter et al. 2014a](#)). A waterbirth may be followed by the birth of the placenta in or out of the water.

The **safety of water immersion during labor has already been firmly established** ([Cluett et al. 2009](#)). In contrast, there is a lot of controversy in the U.S. about the safety of waterbirth. So in this article, we will primarily focus on the evidence surrounding the safety of **water birth**.

What is the history of waterbirth?

Although there are some accounts of waterbirths that occurred in ancient times or in various cultures, waterbirth did not emerge as a widespread practice until the 1980s and 1990s.

- In 1805, the first research account of a waterbirth was published in a French journal.
- In 1980, the first U.S. water birth was documented, and water immersion during labor became more popular due to reports of increased pain relief, easier movement, and a more holistic experience ([RCM 2006](#)).
- **In 1983, Dr. Michel Odent published a widely-cited article in the *Lancet* describing 100 waterbirths that occurred in a hospital in France.**
- In 1989, [Waterbirth International](#) was established in Santa Barbara, California. This 501-c-3 non-profit foundation has assisted with the installation of birthing pools in more than 200 hospitals in the U.S. as well as in dozens of other countries.
- In 1991, Dr. Rosenthal published a research study describing 483 waterbirths that occurred in a birth center in California.
- **In 1992, the United Kingdom House of Commons released a report stating that all women should have the option of laboring and giving birth in the water** ([RCM 2006](#)).
- By 1993, all labor units in England and Wales had offered immersion in water during labor and/or birth, and nearly half had installed birthing pools. During this time period, less than 1% of births in England and Wales occurred in the water ([Gilbert and Tookey 1999](#)).
- In 1994, the Royal College of Obstetricians and the Royal College of Midwives released statements endorsing waterbirth as an option, as long as birth attendants had the appropriate skills and confidence to assist women who wanted to give birth in the water. Their statements were updated and reaffirmed in 2000 and 2006 ([RCM 2006](#)).
- In 1995, the United Kingdom hosted the first International Waterbirth Congress in London. During this conference, 19,000 cases of waterbirth were presented to 1,500 attendees from around the world.
- In 1996, the University of North Carolina School of Nursing, together with Waterbirth International, hosted the first U.S. waterbirth conference in Greensboro, North Carolina.
- In 2000, Waterbirth International hosted an International Waterbirth Congress in Portland, Oregon.
- In 2004, the U.S. Food and Drug Administration (FDA) notified Waterbirth International that they needed to file a request for portable birth pools to be classified as medical devices.

- **In 2005, the American Academy of Pediatrics released an opinion statement rejecting waterbirth** ([Batton et al. 2005](#)).
- In 2012, a joint meeting was called by the FDA to determine if birth pools are Class 1 medical devices. To read the ACNM's summary of this meeting, click [here](#). The FDA has not yet released a decision.
- **In 2014, the American College of Obstetricians and Gynecologists and the AAP released a joint statement (very similar to the 2005 AAP statement), rejecting waterbirth.**

The RCOG/RCM statement has more information on the history of waterbirth—to read the full document, click [here](#).

What kind of research evidence do we have on water birth?

The first research

The first paper describing **a series of waterbirths was published by Dr. Michel Odent** in 1983. This was not a research study, but a description of the waterbirths that had taken place in their hospital unit. In 1991, Dr. Rosenthal published a more formal research study describing waterbirths that happened in a birth center in California.

In 1993, three obstetricians from Switzerland published an article called, “Water birth—is it safe?” in the *Journal of Perinatal Medicine* (Zimmermann et al. 1993). The authors reviewed the papers that had been published by Odent and Rosenthal, and they described the information coming from magazines and newspapers about waterbirth.

Because there were so little data on the safety of waterbirth, Zimmerman said:

“Water births should be restricted to centers with adequate medical assistance, and then only in randomized, controlled studies. The study protocol should fulfill the Helsinki Declaration and should be approved by the local ethical committee... in any other setting water births should be rejected, since too little is known about the safety of this method.”

Over the next two decades, there was a large increase in the research evidence on waterbirth. Yet **this opinion—that waterbirth should “only be conducted in a clinical trial”—would be echoed again in both the 2005 AAP and the 2014 ACOG/AAP Opinion Statements.**

Audits from Great Britain

In the mid 1990's, British researchers **began publishing retrospective surveys of waterbirths** ([Alderdice et al. 1995](#); [Gilbert and Tookey 1999](#)). Retrospective surveys are a lower quality form of evidence, in which researchers look back in time (“retro”) at medical records in order to make conclusions.

These retrospective studies were also “survey” studies, meaning that the researchers called and wrote letters to maternity units and physicians, asking them if they could recall any deaths or injuries related to waterbirth in their units.

Although the early retrospective studies found that overall waterbirth appeared to be safe, their evidence should be read with caution, because of the unreliable nature of this type of study.

Two small randomized trials

In 2004 and 2009, **the first pilot randomized, controlled trials on waterbirth were published.** In a randomized, controlled trial, mothers are randomly assigned (like flipping a coin) to either birth in the water or on land ([Woodward and Kelly 2004](#); [Chaichian et al. 2009](#)).

Unfortunately, **both of the randomized trials were too small to tell differences in rare but important outcomes.** Researchers have estimated that there would need to be at least 1,000 women in each arm of a water birth trial in order to see at least two rare events occurring ([Burns et al. 2012](#)).

In the first randomized trial, **only 10 out of 40 women who were randomly assigned to waterbirth actually gave birth in the water**, and 5 other women in a “preference” arm chose to give birth in the water ([Woodward and Kelly 2004](#)). Because only 15 women gave birth in the water, this gave us basically no information about the effects of waterbirth.

In the second randomized trial, 53 women gave birth in the water and 53 women gave birth in land. All of the women gave birth in their assigned group ([Chaichian et al. 2009](#)).

Although **the Chaichian study was too small to look at rare effects, it did give us some good information about what happens when women are randomly assigned to give birth in water versus land.** However, the authors did not report enough information (they did not follow the [CONSORT guidelines](#)) to give us a good idea about the quality of the study.

What did we learn from these randomized trials? Both Woodward and Kelly ([2004](#)) and Chaichian et al. ([2009](#)) showed that it is **technically possible** to conduct a randomized, controlled trial of waterbirth.

However, we also learned that **a large randomized trial (with 2,000+ women) is probably impractical** and could have high rates of “cross-over” between groups, with women assigned to give birth in water giving birth on land, and vice versa.

Because randomized trials are impractical and unlikely to happen, this means that **we must turn to other types of evidence about waterbirth.** Prospective, observational studies can give us evidence on the safety of treatments that are difficult or impractical to study in randomized trials.

High quality prospective studies are published

In prospective studies, **researchers enroll women while they are still pregnant and then follow them until after their babies are born**, collecting data all along the way. A strength of this type of study is that it gives us accurate information about what happens to all women who are enrolled in the study and have waterbirths.

In the late 2000s and early 2010s, **researchers began recording thousands of waterbirths in prospective studies, with zero reports of newborn drowning or near drowning** (see Table 1). These studies also showed some benefits for mothers—and even some potential benefits for the newborns.

However, there are **two main drawbacks** of these types of prospective studies.

First, **some of the researchers did not include comparison groups**, so in those studies, we have no way to compare women who had waterbirths with those who did not.

The second drawback is that when researchers did compare groups, **most of the time they compared women who had waterbirths with women who labored in water and then got out for the birth**.

Why is this a drawback? Well, **women may get out of the tub for many reasons**: the midwife or physician may have concerns with the fetal heart rate, the mother needs pain medicine, or perhaps because the mother's labor was taking too long. In contrast, mothers who stay in the tub for a waterbirth are already doing well, and may be more likely to have better results. So these two groups are not equal to begin with.

In research, we call this a “self-selection” bias. This means that **any differences that we observe between these two groups might not be because of the waterbirth itself, but because the two groups were different to begin with**.

In an ideal world, we would compare women who had waterbirths to women who wanted waterbirths and were eligible for waterbirths but didn't have access to a tub. Unfortunately, that kind of comparison has not been done in most studies.

Case control studies

Several researchers have published waterbirth **case control studies**, a type of observational study. In a case control study, researchers **match each woman who had a waterbirth with a similar woman who had a land birth**. The strength of this type of study is its matched comparison group.

For example, Otigbah et al. ([2000](#)) compared 301 women who had waterbirths with 301 matched women of the same age, same number of previous births, and low risk status who

had conventional vaginal deliveries on land without Pitocin augmentation. Although this doesn't totally eliminate the self-selection bias, it **helps limit the bias** by trying to match the waterbirth and land birth groups as best as possible.

Case reports

Finally, the other type of evidence that we have is case reports. **Case reports are considered the lowest level of research evidence.**

Over the past few decades, researchers have published multiple case reports about adverse events that were related to (or possibly related to) waterbirth (**see Table 2**).

A strength of a case report is that it **can give us information about rare side effects of a treatment**. However, since case reports only discuss a single event, **we do not know often this side effect occurs**.

Because case studies are considered one of the lowest forms of research evidence, some research experts on waterbirth have said that:

“Neither opponents nor proponents serve women and babies well by continuing to accumulate anecdotal reports to support their own biases” ([Cluett et al. 2005](#)).

What kind of research did ACOG and the AAP rely on in their Opinion Statement on Waterbirth? Low Level of Evidence

When discussing the reported complications from waterbirth, **ACOG/AAP almost exclusively used case reports**, and did not really look at results from higher levels of evidence. Higher levels of evidence that are available include prospective, observational studies and retrospective surveys.

In the opinion statement, the authors said that “because the denominators are not uniformly reported, the exact incidence of complications is difficult to assess.” **This problem could have easily been solved by reviewing the large prospective studies that have already been published.** These large studies have described how often rare events do or do not occur.

Outdated Literature Review

The **literature review in the opinion statement was outdated and did not reflect current evidence**. Out of 29 references, **only six were from the past nine years** (2005 or later). These references included a small randomized trial on waterbirth ([Chaichian et al. 2009](#)), the updated statement from the Royal College of Obstetricians and Gynaecologists ([RCM 2006](#)), an opinion piece in Midwifery Today (Enning 2011), a small interview study with five women

([Maude and Foureur 2007](#)), and a case study where an infant died after being born into a tub heavily contaminated with *Pseudomonas* ([Byard and Zuccollo 2010](#)).

For this Evidence Based Birth article, **I easily identified at least seven recent studies (see Table 1)**—five of which were very high quality prospective studies—**that were not mentioned in the opinion statement**. This raises the question as to whether the authors conducted a thorough literature review before forming their opinion.

What kind of mistakes are in the ACOG/AAP Opinion Statement on Waterbirth?

In addition to the outdated literature review and failing to mention the important waterbirth studies that have been done in the past ten years, **the ACOG/AAP Opinion Statement contained several major mistakes**.

You may want to [print off the PDF version of the ACOG/AAP opinion statement](#) so that you can look at the mistakes for yourself while you read along here.

You can also download a 4-page ["To whom it may concern" letter](#) to use with hospital administrators and others who may be interested in learning more about the scientific quality of the Opinion Statement.

Major Errors

The authors cited **nine case reports** that show complications of water birth “for the mother and the neonate.” **Three of these studies had nothing to do with waterbirth**. So the reference to nine case studies is misleading:

- **Reference #19 is not a case report**. It is a randomized, controlled trial of water immersion during the first stage of labor. Waterbirth was not studied in this trial ([Eckert et al. 2001](#))
- **Reference #22 is not a case report** ([Gilbert 2002](#)). It is a letter to the editor about a different case study that had already been discussed once in the opinion statement ([Nguyen et al. 2002, reference #25](#)).
- **Reference #24 is a study of pregnant laboratory rats** who were randomly assigned to exercise swim in cold water during pregnancy or swim in warm water. The rats were killed and the fetuses were examined. **No laboratory rats gave birth in water** ([Mottola et al. 1993](#)).

Misrepresentation of research findings

Next, the ACOG/AAP authors **misrepresented the results from a study, leading the reader to think that there were waterbirth drownings in a study when there were actually none**.

- **Reference #26 is a retrospective survey study in which the authors report finding *no perinatal morbidity or mortality* related to water birth** ([Alderdice et al. 1995](#)). The authors of the ACOG/AAP opinion statement misrepresent this study and state that “Alderdice et al. summarized case reports of adverse neonatal outcomes, including drownings and near drownings.” I was confused by this contradiction between what the article reported and what the opinion statement stated. So I personally contacted the author for the Alderdice et al. article. **She confirmed that no drownings or near-drownings occurred.**

Not telling the whole story

Of the four other case studies mentioned by ACOG and the AAP, they did not tell the whole story. **Two of the cases were caused by the hospital’s contaminated water supply, and in the other cases, all of the infants made a full recovery:**

- In two cases (**References # 19 and #21: [Byard and Zuccollo 2010](#)** and Franzin et al. 2004), the **hospital water supply was contaminated** with *Pseudomonas* or *Legionella* bacteria. Other prospective studies have found no difference in infection rates between babies born in the water and those born on land ([Thoeni et al. 2005](#); [Zanetti-Daellenbach et al. 2007](#)). Culture studies have also shown that exposure to potentially harmful bacteria from the hospital water supply can be reduced by installing water filters ([Thoeni et al. 2005](#)).
- In the Kassim et al. ([2005](#)) case study (**Reference #23**), one infant developed respiratory distress due to suspected water aspiration. Within three days of treatment, **the infant made a complete recovery**. The authors did not report whether the care providers had followed evidence-based safety measures, such as monitoring water temperature or bringing the baby immediately out of the water.
- In the Nguyen et al. ([2002](#)) article (**Reference #25**) which reported four cases of water aspiration, one case was an **accidental water birth and two were hidden water births. All four infants made a complete recovery**. The authors did not report whether all the births were attended by care providers. The water temperature was not known, and they didn’t say whether the infants were immediately brought out of the water.

Relied heavily on a flawed review

The final case study mentioned in the ACOG/AAP statement is actually a 2004 review of the literature published by Pinette, Wax et al. (of the [Wax home birth meta-analysis](#)) in 2004. In this review, **the authors found 74 articles on waterbirth, but only reviewed the 16 articles that reported possible complications related to waterbirth.**

Although Pinette et al. stated that they “systematically reviewed the literature,” their methods were **seriously flawed:**

1. They did not describe the inclusion/exclusion criteria that they used for articles.
2. They only reviewed articles that showed complications, and excluded articles with good outcomes.
3. The quality of the articles that they included was poor. Almost all of the studies that they included were case reports, including a magazine story, a non-peer reviewed abstract, and letters to the editor.

In particular, Pinette et al. referenced an article (Rosser 1994) that they described as evidence of “two home births with likely drowning.”

However, **if you actually read the Rosser article**, you will find out that it is a **magazine article** that describes three stories that have not been confirmed to be true. One story described the death of a baby who was born **on land** in the caul (inside the sac of membranes), and drowned because the parents did not know how to take it out of the membranes. The other story described an unattended waterbirth in which the infant drowned after the parents left it underwater for 25 minutes. A third story described an infant who died after a home waterbirth attended by two experienced midwives—however, they did not say how quickly the baby was brought to the surface of the water.

Finally, Pinette et al. stated that the literature “failed to demonstrate any benefit to the neonate.” **They did not provide any references for this statement.**

Because the Pinette et al. review had serious scientific problems, it is surprising that it was referenced by ACOG/AAP in their Opinion Statement on waterbirth.

So what IS the evidence on waterbirth?

To answer this question, in April 2014 I conducted a thorough review of the literature on PubMed. I have published my findings online both in this article, and in a more detailed format in the Evidence Based Birth Annotated Bibliography on Waterbirth. I then used the Annotated Bibliography to write this Evidence Based Birth article.

To download the Annotated Bibliography, click [here](#).

To read more about the methods for Evidence Based Birth articles, click [here](#).

The specific keywords for the literature review included “childbirth” AND “water immersion” OR “water birth.” Articles were included in the Annotated Bibliography if they were published in the English language after the year 1993, and if researchers described outcomes from births that occurred underwater.

I included all levels of research evidence on this topic: systematic reviews, randomized controlled trials, prospective observational studies, retrospective survey or scientifically-conducted retrospective audit studies, qualitative studies, and case reports.

I excluded audit reports that did not follow the scientific method. For example, I excluded audits that did not have Institutional Review Board approval or did not report adequate statistics.

Also, if a research study was reported in two separate articles, I only included the most recent version.

After the initial search was conducted, I read through titles and abstract to find out which articles fit the inclusion criteria. If an article was relevant, I obtained and read the whole article. I looked at the reference list from each paper to see if there were any other articles that I should include.

Again, the PDF of the entire 70+ page Annotated Bibliography is available for download [here](#).

The results are summarized here in Table 1 (randomized trials, prospective studies, and retrospective studies) and Table 2 (case reports), in chronological order.

When looking at the studies in Table 1, you can see that there have been more than 28,000 waterbirths documented in research studies since 1991.

In fact, there have been at least 19 studies on waterbirth in the past 20 years, and ACOG/AAP only mentioned six of these in their opinion statement. Out of the six papers that they referenced, they completely misrepresented the results of one study. **Thus the vast majority of the research literature on water birth was not covered in ACOG and AAP’s review of the literature.**

Table 1: Evidence on Waterbirth

First Author	Year	Study Design	# Waterbirths & # Land Births	Included in the ACOG/AAP Opinion?
Rosenthal	1991	Retrospective	679 women who had waterbirths; no comparison group	No
Alderdice	1995	Retrospective survey of maternity units that was completed by phone or mail	4,494 women who had waterbirths, 8,255 women who labored in water and birthed on land	Yes, but the study results were misrepresented
Gilbert	1999	A retrospective survey sent to consultant pediatricians and maternity units	4,032 women who had waterbirths, their outcomes were compared to regional data for low-risk women who had land births (spontaneous vaginal deliveries at term)	Yes

Forde	1999	Prospective	49 waterbirths; no comparison group	No
Otigbah	2000	Case control	301 women who had waterbirths, 301 matched (similar) women who had land births	No
Burns	2001	Prospective	1,327 women who had waterbirths, compared to a matched group of women in the same unit who did not use the pool	No
Richmond	2003	Retrospective survey study with collection of quantitative and qualitative data	189 women who had waterbirths; no comparison group	No
Wu	2003	Qualitative interview study	9 women who had waterbirths	No
Geissbuehler	2004	Prospective	3,617 women who had waterbirths, 5,901 women who had land births; all births were spontaneous vaginal births with a single baby in head-down position. Some of the land birth group included women who were planning a waterbirth but had to transfer to land births (n = 647).	Yes
Fehervary	2004	Case control	Microbiome study: 34 infants born in water, 26 infants born on land after labor in water, 36 infants born on land Case control study: 100 infants born in water compared to 100 infants born on land without water immersion	No
Woodward	2004	Pilot randomized controlled trial	15 women who had waterbirths, 65 land births	Yes
Eberhard	2005	Prospective	3,327 waterbirths, 2,763 land births in bed, and	No

			1,049 births on birthing stools	
Thoeni	2005	Prospective	1,600 women who had waterbirths, 515 women who had land births. For most of the outcomes, only women giving birth for the first time were included: 737 women who birthed in the water; 407 in bed; and 142 on a delivery stool.	No
Zanetti-Daulenbach	2007	Prospective	89 women who had waterbirths, 133 women who labored in water and had land births, 146 women had no water immersion at all. All of these women were interested in waterbirth and met the inclusion criteria for waterbirth.	No
Mistrangelo	2007	Case control study with ultrasound evaluations of the pelvic floor 6 months postpartum	25 first-time mothers who had waterbirths and 27 first time mothers who had land births with no water immersion	No
Cluett	2009	Cochrane review and meta-analysis of randomized, controlled trials	3 small pilot randomized, controlled trials	Yes
Chaichian	2009	Pilot randomized controlled trial	53 women who were randomly assigned to waterbirth, 53 women who were randomly assigned to land birth. All women birthed using their assigned method.	Yes
Torkamani	2010	Prospective	50 women who had waterbirths and 50 women who had land births	No

Pagano	2010	Retrospective case control study with economic impact measurement	110 waterbirths of women giving birth for the first time, and 110 matched women who had land births	No
Burns	2012	Prospective	5,192 women who had waterbirths, 3,732 women who labored in water and had land births**	No
Mollamahmutoglu	2012	Prospective	207 women who chose waterbirths, 191 women who had land births with an epidural, and 191 women who had land births with no epidural	No
Dahlen	2013	A retrospective study of medical records	819 women who had waterbirth and 5,220 women who had land births in an “alongside” midwifery unit. Women who transferred to the hospital labor and delivery unit during labor were not included.	No
Manakaya	2013	Retrospective Case Control	219 women who had waterbirths, 219 matched women who had land births and served as a control group	No
Demirel	2013	Retrospective	191 women who had waterbirths; there was no comparison group	No
Henderson	2014	Prospective	1,519 women who had waterbirths, 986 women who had land births. To compare outcomes between water immersion and land birth, they used data from one site where 114 women used a birthing pool (either had a waterbirth or left the pool before the birth) and 459 women who were eligible to but did not use the pool due to	No

			preference or unavailability of the pool.*	
Lukasse	2014	Prospective	Number of waterbirths not disclosed, but the overall sample (n = 16,577) of women who gave birth in midwifery settings included a substantial percentage of waterbirths	No

**Henderson et al. (2014): Because the “birth pool” group (used for comparison purposes) included women with and without waterbirths, I did not include the Henderson et al. study in any comparisons of waterbirth and land birth.*

***Burns et al. (2012): It is impossible to compare most of the results between women who had waterbirths versus women who labored in tub but had land births, because the researchers did not report most results separately. The outcomes were reported all together, with the exception of umbilical cord snap, physiological third stage, and neonatal deaths.*

Total # of water births that have been recorded in research studies = 28,283

Limitations of the Evidence

Before you read the evidence on waterbirth, it is important to understand that **there are drawbacks to the evidence** that we have so far.

1. **Some studies did not have a comparison group.** This means we cannot compare waterbirths to land births. However, if the study is large (such as [Henderson et al. 2014](#)), we can still get some useful information about how often certain rare events may occur—even if there isn’t a comparison group.
2. Many studies were **too small to look at rare side effects**—you need about 1,000 waterbirths and 1,000 land births to see any differences in rare events between groups ([Burns et al. 2012](#))
3. In observational studies where researchers did compare waterbirths to land births, there is something called a “selection bias.” **Selection bias means that one group may do better than the other group—not because of the waterbirth or land birth, but because the two groups were different to begin with.**

For example, women who chose waterbirth may have fewer episiotomies because they were more motivated to give birth without an episiotomy.

Or infants born to women who had land births may have higher NICU admission rates because their mothers got out of the tub due to concerns with the fetal heart rate.

Because women in the waterbirth and land birth groups are self-selected, we can’t say that waterbirth *caused* an effect or land birth *caused* an effect.

However, **some of the findings from the observational studies were very similar to results from the Chaichian randomized trial**, where women were randomly assigned to waterbirth or land birth, and similar to case-control studies, where women were matched more evenly between waterbirths and land births.

Also, **some findings were very consistent from study to study**—for example, **episiotomy rates were lower in waterbirth in every single study that looked at episiotomies**. So all together, this gives us confidence that waterbirth may have some treatment effects above and beyond the “selection” effect.

What does the research have to say about the effects of waterbirth on mothers?

Note: In the section below, I did not include the Cluett meta-analysis (I reported results from the individual studies instead) or the Woodward and Kelly randomized trial (because there were only 15 waterbirths). For the most part, I only included results from studies where waterbirths were compared to land births. However, because the Burns et al. (2012) and the Henderson et al. (2014) studies were large and of very high quality, I mention some of their results even though they didn't have a comparison group.

Normal Vaginal Birth

In one randomized trial with 106 women, researchers found that women who were assigned to waterbirth had **higher rates of spontaneous vaginal births** (no vacuum or forceps) compared to women who were randomly assigned to give birth on land (100% vs. 79.2%) ([Chaichian et al., 2009](#)).

In another study, researchers found that the C-section rate for all women who labored in water and/or gave birth in the tub was only 4.4%, compared to a national Italian average of 38% ([Henderson et al., 2014](#)).

Similarly, in a study using the Birthplace in England data, researchers found that water immersion during labor among first-time mothers who had midwifery care decreased their risk of C-section by 20% ([Lukasse et al. 2014](#)).

Most of the other studies excluded women who gave birth by Cesarean, so it is usually impossible to compare C-section rates between women who plan waterbirth and those who plan land births.

Episiotomy

An episiotomy is when the physician uses scissors to make a surgical cut in the perineum during birth. Research evidence has shown that [episiotomies are more harmful to mothers than a natural tear](#), increase the risk of severe perineal trauma, and should rarely be used ([Carroli and Mignini 2009](#)). <http://www.ncbi.nlm.nih.gov/pubmed/19160176>

In **nine out of nine studies**, researchers found a **decrease or elimination in the use of episiotomies** for women who had waterbirths, compared to those who had land births.

The association between waterbirth and a decreased episiotomy rate was quite strong, with researchers reporting anywhere from a two-fold to 33-fold reduction in the use of episiotomies in the water ([Otigbahl et al. 2000](#); Burns 2001; [Geissbuehler et al. 2004](#); [Thoeni et al. 2005](#); [Zanetti-Daellenbach et al. 2007](#); [Chaichian et al. 2009](#); [Torkamani et al. 2010](#); [Mollamahmutoglu et al. 2012](#); [Menakaya et al. 2013](#)).

This finding makes sense, because it is much more difficult for a care provider to cut the mother's perineum when she is in the water.

First or Second Degree Perineal Tears

Rates of 1st or 2nd degree perineal tears were higher in women who gave birth in water in five out of seven studies ([Otigbah et al. 2000](#); [Geissbuehler et al. 2004](#); [Zanetti-Daellenbach et al. 2007](#); [Chaichian, Akhlaghi et al. 2009](#); [Mollamahmutoglu et al. 2012](#)), and in three studies there was no difference (Burns 2001; [Thoeni et al. 2005](#); [Menakaya et al. 2013](#)).

Researchers say that the reason **1st and 2nd degree tear rates are higher in women who have waterbirths is because** many of these women would have had episiotomies instead if they had given birth on land.

On the other hand, women who had land births had lower 1st and 2nd degree tear rates, but only because many of them were cut surgically (with episiotomies) instead of being allowed to tear naturally.

To learn more about the difference between 1st, 2nd, 3rd, and 4th degree tears, click [here](#).

Third and Fourth-Degree Tears

Third and fourth-degree tears cause injury to the anal sphincter. These tears can lead to difficult complications for the mother, including fecal incontinence, long-term problems with perineal pain and painful sex, fistulas, and wound infections ([Fernando et al. 2013](#)). Evidence shows that episiotomies can increase the risk of severe perineal trauma like that seen in 3rd and 4th degree tears ([Carroli and Mignini 2009](#)).

In two out of three studies that examined this outcome, **rates of 3rd and 4th degree tears were lower in women who had waterbirths** compared to women who had land births ([Geissbuehler et al. 2004](#); [Menakaya et al. 2013](#)). In one study, researchers found no difference in 3rd and 4th degree tears (Burns 2001).

Several other studies reported the rates of severe tears, but did not have a comparison group:

- In a study with 1,519 Italian women who had waterbirths, Henderson et al. ([2014](#)) found that 0.3% of women who had waterbirths had a 3rd degree tear, and there were zero 4th degree tears.
- In the United Kingdom, Burns et al. ([2012](#)) reported that 2% of 5,192 women who had waterbirths had a 3rd degree tear. They did not report 4th degree tear rates.

Intact Perineum

Four out of five studies found that women who had waterbirths had a **better chance of birthing with an intact** perineum ([Otigbah et al. 2000](#); Burns 2001; [Geissbuehler et al. 2004](#); [Thoeni et al. 2005](#)). In one study there was no difference between rates of intact perineum between waterbirths and land births ([Menakaya et al. 2013](#)).

Researchers think that the reason intact perineum rates are higher in waterbirths is because episiotomy rates are lower in waterbirths.

Wait—so there are higher rates of intact perineum in waterbirth? But didn't you say that women who have waterbirths have higher rates of 1st and 2nd degree tears?

Here's the main thing—women who have waterbirths have a much lower chance of episiotomy. If you don't have an episiotomy, you may tear naturally, or you may not. But overall, there are **so many more episiotomies in land births** that this is why there are higher rates of intact perineum in waterbirths.

Major Perineal Trauma

In one study, researchers found that women who gave birth in water had a **lower risk of having major perineal trauma** compared to those who gave birth on a birthing stool ([Dahlen et al. 2013](#)). They defined major perineal trauma as a 2nd, 3rd, or 4th degree tear.

Compared to waterbirth, women who gave birth on a stool were 1.4 times more likely to have major perineal trauma, even after taking into account whether or not the mother had given birth before, the length of the second stage, and whether the care provider was a midwife or OB.

There was no significant difference in major perineal trauma between women who gave birth in the water and those who had land births kneeling, semi-laying down, lying on their side, standing, or squatting.

Need for pain relief

In seven out of seven studies that looked at the relationship between waterbirth and the need for pain relief, women who gave birth in water **used less pain medications compared to**

women who had land births. Three research teams found that fewer women who gave birth in water required any pain relief at all ([Otigbah et al. 2000](#); [Geissbuehler et al. 2004](#); [Chaichian et al. 2009](#); [Torkamani et al. 2010](#)), and two research teams mentioned that women who had waterbirths had a 0% epidural rate ([Thoeni et al. 2005](#); [Zanetti-Daellenbach et al. 2007](#)).

Pain scores

Two out of three researchers found that women giving birth in water have lower pain scores than women giving birth on land ([Torkamani et al. 2010](#); [Mollamahmutoglu et al. 2012](#)).

Torkamani et al. found that on a visual analog scale from 0 to 10, women who had waterbirths had pain ratings of 3.53 compared to 6.96 in women who had land births. However, it is not clear when they measured pain levels.

In another study, Mollamahmutoglu et al. ([2012](#)) measured pain using the same scale among women who had waterbirths and compared it to women who had land births with and without epidurals.

They found that **women who had waterbirths had average pain ratings that were lower than all the women who had land births—even lower than the women with epidurals.** First-time mothers who gave birth in the water had an average pain score of 4.6, compared to 5.8 and 5.7 in women who had land births with and without epidurals. Mothers who had given birth before and were giving birth in the water this time had an average pain score of 4.7, compared to 5.8 and 5.6 in women who had land births with and without epidurals. However, it was not clear when the researchers measured pain levels.

In the largest study so far to compare pain levels between waterbirths and land births, Eberhard et al. ([2005](#)) followed 3,327 women who had waterbirths, 2,763 women who had land births in bed, and 1,409 women who gave birth on a Maia stool.

On a scale from 0-100 with 0 being no pain and 100 being intolerably strong pain, average pain levels from the late first stage through the second stage were high for all three groups, ranging from 69-77. Out of all the women who had land births in bed, about 13% had epidurals for pain relief, and 32% of women who had given birth before and 65% of women giving birth for the first time had medication injections or suppositories for pain relief.

A smaller number of women having waterbirths had medication injections for pain relief (15%- 35%).

The researchers found that in women giving birth for the first time:

- During early labor (1-3 cm), women choosing land births in bed reported more pain than those choosing water births or Maia stool births.
- During pushing, women choosing waterbirths reported higher levels of pain compared to women who had land births in bed.

- After the birth, women who had waterbirths recalled a lower level of pain than those who had land births in bed.
- There were no other differences between groups with expected levels of pain, late first stage pain levels, or levels of pain in the second stage before pushing began.

Among women who had given birth before:

- Before labor began, women who had land births in bed expected a lower amount of pain than women who had waterbirths.
- During early first stage (1-3 cm), women who had waterbirths had lower pain levels than women having land births in bed.
- During late first stage, women who had waterbirths reported lower levels of pain than land births in bed.
- During pushing, women who had waterbirths reported higher levels of pain than women who had land births in bed.
- After the birth, women who had waterbirths recalled a lower level of pain than women who had land births in bed.

Because the pain levels were high in all of the groups, the researchers concluded that water birth relieves labor pain “in just as poor a manner” as do morphine drugs.

In other words, when used for pain relief, the effects of waterbirth are very similar to the effects of medications for pain (epidural or narcotics) during a land birth. However, the authors point out that waterbirth does not have the side effect of decreasing the mother’s level of consciousness or suppressing newborn respiration.

Another important finding of this study was **that women who had land births in bed had lower levels of pain during pushing**. However, **after the birth, women who had waterbirths recalled less pain**.

Because of this finding, the researchers propose that waterbirth may **alter women’s perceptions so that after birth, women remember the birth as being less painful than it actually was**. This may have an important influence on women’s feelings about their birth, and could explain why qualitative researchers have found that women generally use very positive words to describe their waterbirths ([Richmond 2003](#)).

Length of the First Stage of Labor

The **results on the length of the first stage of labor are mixed**. Three out of five research studies showed that women who had waterbirths had a shorter first stage of labor compared to women who had land births ([Zanetti-Daellenbach et al. 2007](#); [Chaichian et al. 2009](#); [Torkamani et al. 2010](#))

One study found no difference in the average length of the first stage of labor between waterbirths and land births ([Menakaya et al. 2013](#)).

In another study, researchers found that there was a longer first stage of labor during waterbirth—both for women who had given birth before and those who were giving birth for the first time ([Mollamahmutoglu et al. 2012](#)).

It is hard to figure out the relationship between waterbirth and the length of the first stage of labor. This is because researchers usually do not record how much time women spend in the water before giving birth.

Also, most researchers do not say how they defined the beginning and the end of each stage of labor.

Finally, although some researchers separated the results depending on whether women had given birth before, others did not. On average, mothers giving birth for the first time may have longer labors, and this was not always figured into the results.

Length of the Second Stage of Labor

Research **results on the length of the second stage are mixed**. Three researchers found that women who had waterbirths had shorter pushing phases ([Zanetti-Daellenbach et al. 2007](#); [Torkamani et al. 2010](#); [Mollamahmutoglu et al. 2012](#)), while two researchers found no difference between waterbirths and land births in the length of the second stage ([Chaichian et al. 2009](#); [Menakaya et al. 2013](#)).

Only one study separated out women who had given birth before and those who were giving birth for the first time. They found that in both of these groups, the average length of the second stage was shorter in waterbirths ([Mollamahmutoglu et al. 2012](#)).

In another study, Thoeni et al. ([2005](#)) found that the overall duration of labor was shorter in women giving birth in the water, and they stated that this was mostly due to a decrease in the average length of the second stage.

Length of the Third Stage of Labor

Only four researchers have compared the length of the third stage of labor between waterbirths and land births, and the **results are mixed**.

Two of the studies found that the third stage was shorter ([Chaichian et al. 2009](#); [Mollamahmutoglu et al. 2012](#)), one research study reported a longer third phase ([Zanetti-Daellenbach et al. 2007](#)), and one study found no difference in the length of the third stage ([Thoeni et al. 2005](#)).

These results are complicated by the fact that some researchers required mothers to get out of the tub to birth the placenta ([Mollamahmutoglu et al. 2012](#)); while in other studies they didn't say whether women got out of the tub during the third stage.

The management of the third phase of labor was probably different from study to study, but it is difficult to tell because the management style was usually not recorded.

No studies have compared giving birth to the placenta in the tub versus on land.

Postpartum Blood Loss

Out of six studies, three found a **significant decrease in postpartum blood loss** after waterbirths ([Geissbuehler et al. 2004](#); [Zanetti-Daellenbach et al. 2007](#); [Dahlen et al. 2013](#)), while three studies found **no differences in blood loss** between waterbirth and land birth ([Otigbah et al. 2000](#); [Thoeni et al. 2005](#); [Menakaya et al. 2013](#)).

In two of three studies ([Geissbuehler et al. 2004](#); [Zanetti-Daellenbach et al. 2007](#)), researchers found that women who had waterbirths had much higher hemoglobin levels after birth compared to women who had land births.

In one study, researchers found that **women who gave birth on a birthing stool on land were two times more likely to have a postpartum hemorrhage than women who had waterbirths**, even after taking into account birth weight, whether the mother had given birth before, the length of the second stage, whether the care provider was a midwife or OB, and whether the mother had any perineal trauma ([Dahlen et al. 2013](#)).

Upright birth positioning

In the Henderson et al. ([2014](#)) study, researchers compared a small subgroup of women who used the birthing pool at some point during labor to those who did not use the pool at all because it was not available or they did not want to use it. They found that women who used the pool were more likely to have an upright birth position and a hands-off delivery technique.

When the researchers looked at all of the women who actually birthed in water (n = 1,519), they found that 87% of women used upright positioning during birth

Hands-off delivery

“Hands-off” means that the care provider does not forcibly touch the baby’s head as it is coming out. The hands-off delivery method is frequently recommended in clinical guidelines for waterbirth ([RCM 2006](#); [Nutter, Shaw-Battista et al. 2014](#)).

In the large Henderson et al. ([2014](#)) study, researchers found that 79% of women who had waterbirth had a hands-off delivery.

Satisfaction

In one study, 72.3% of women who had waterbirths stated that they would certainly choose this method of giving birth again, while only 8.7% of women who had land births would choose that method of giving birth again ([Torkamani et al. 2010](#)).

Pelvic floor function

Only one study has looked at the effects of waterbirth on pelvic floor function. Using ultrasound tests, Mistrangelo et al. ([2007](#)) found no differences in pelvic floor function at six months postpartum between 25 first-time mothers who had waterbirths and 27 first-time mothers who had land births.

What does the research have to say about the effects of waterbirth on infants?

Perinatal mortality

Researchers have not seen any increased risk of perinatal mortality (stillbirth or death of a newborn) with birth in water.

In 1999, Gilbert made phone calls to maternity units and pediatricians in the United Kingdom and asked if they knew of any deaths or NICU admissions that had happened within 48 hours of labor *or* birth in water. Out of 4,032 waterbirths, there were 5 perinatal deaths, none of which were related to water immersion. Two babies were stillborn, one after a hidden pregnancy and unattended home birth with no prenatal care. The other stillbirth was diagnosed before the mother got in the water. All three newborn deaths were due to pathological conditions: herpes, intracranial hemorrhage, and hypoplastic lungs.

Overall, the perinatal mortality rate for waterbirth was 1.2 deaths per 1,000 births (Confidence Interval 0.4-2.9). When researchers compared this with regional statistics for low risk, spontaneous, normal vaginal births at term, there was no increase in the risk of perinatal death with waterbirth.

Out of these same 4,032 waterbirths, there were two NICU admissions for water aspiration that were possibly attributed to waterbirth. One of these cases resulted in brain damage.

The information from Gilbert et al. ([1999](#))'s study should be viewed with extreme caution because of its retrospective survey design.

Despite this major limitation, and even though there was only one case of brain damage possibly attributed to waterbirth out of more than 4,000 waterbirths, this article has been used by anti-waterbirth physicians to show that waterbirth is not safe ([Pinette et al. 2004](#)).

Other researchers (some with strong prospective study designs) **have reported no newborn deaths related to waterbirth**. I have bolded the two high quality studies with the largest sample sizes.

- In 1995, Alderdice et al. reported that out of more than 12,000 births in which women either labored in or gave birth in water, there were a total of 12 newborn deaths. None of these deaths were attributed to laboring or giving birth in water. This study is limited by its retrospective survey design and its inability to separate outcomes between waterbirths and labor in water.
- In a 2000 case control study, Otigbah recorded no newborn deaths after 301 waterbirths.
- In a 2001 prospective study, Burns reported that out of 1,327 waterbirths, one newborn died four days after birth due to [vasa previa](#).
- **In a 2012 prospective study, Burns et al. recorded no newborn deaths after 5,192 waterbirths.**
- In a 2012 prospective study, Mollamahmutoglu et al. reported no newborn deaths after 207 waterbirths.
- In a 2013 retrospective study, Dahlen et al. reported 1 stillbirth out of 819 waterbirths compared to 4 stillbirths out of 5,220 land births. Due to limitations in the data, authors were unable to comment on the causes of death.
- **In a 2014 prospective study, Henderson et al. recorded no newborn deaths after 1,519 waterbirths.**

Apgar Scores at One Minute

The results on one-minute Apgar scores are mixed. Out of six studies that compared one-minute Apgar scores between waterbirths and land births, four studies found no difference in average Apgar scores ([Otigbah et al. 2000](#); [Zanetti-Daellenbach et al. 2007](#); [Chaichian et al. 2009](#); Pagano et al. 2010), and two studies found a higher percentage of waterbirth infants with Apgars <7 at one minute compared to land births ([Mollamahmutoglu et al. 2012](#); [Menakaya et al. 2013](#)). However, both of those studies found no difference at five minutes (see below).

Apgar Scores at Five Minutes

With regard to Apgar scores at five minutes, researchers found that on average, infants born in the water appear to do **just as well or better than those born on land**. Out of eight studies, five researchers found either **no difference** in average Apgar scores or no difference in the percentage of babies with scores ≤ 7 at five minutes ([Otigbah et al. 2000](#); [Zanetti-Daellenbach et al. 2007](#); [Chaichian et al. 2009](#); [Mollamahmutoglu et al. 2012](#); [Menakaya et al. 2013](#)).

The other three researchers found that waterbirth infants had **better Apgar scores** at five minutes:

- One research study found that there was a lower percentage of waterbirth infants with scores of <7 at five minutes compared to infants who were born on land ([Geissbuehler et al. 2004](#)).
- In a study that compared waterbirth to giving birth in different positions on land, Dahlen et al. ([2013](#)) found that infants born in semi-lying positions on land were 4.6 times more likely to have Apgar scores of ≤ 7 at five minutes than waterbirth infants, even after controlling for birth weight, whether the mother has given birth before, second stage > 2 hours, and type of care provider.
- Pagano et al. (2010) found that waterbirth infants had higher average Apgar scores, but overall they were very high in both groups (9.95 vs. 9.84).

In another study that did not include a land birth comparison group, Henderson et al. ([2014](#)) found that only one infant out of 1,519 waterbirth infants had an Apgar of less than 7 at five minutes.

Respiratory Difficulty

In one study of 8,924 low-risk women who were cared for by midwives and either labored or gave birth in water, the prevalence of temporary respiratory difficulty was 31 infants out of 5,192 waterbirths (0.6%) and 35 infants out of 3,732 land births (0.9%). The authors did not report whether this was a statistically significant difference ([Burns et al. 2012](#)).

Birth Injuries

Only one study compared the number of birth injuries between groups. Geissbuehler et al. ([2004](#)) reported fewer birth injuries in the waterbirth group compared to the landbirth group (1.3% vs. 2.8%).

NICU or Special Care Nursery Admissions

Five studies compared NICU or Special Care Nursery admission rates between waterbirths and land births. Two studies reported fewer NICU or Special Care Nursery admissions in the waterbirth group (Burns 2001; [Geissbuehler et al. 2004](#)), two studies reported no difference in NICU or Special Care Nursery admission rates ([Otigbah et al. 2000](#); [Mollamahmutoglu et al. 2012](#)), and one study found an increase in waterbirth infants admitted to the Special Care Nursery ([Menakaya et al. 2013](#)).

In the largest prospective research study to examine this topic (3,617 waterbirths and 5,910 land births), Geissbuehler et al. ([2004](#)) found **fewer NICU admissions in the waterbirth group** (0.2% vs. 0.6%) compared to land birth.

In contrast, Menakaya et al. reported higher special care nursery admission rates among babies who were born in the water. The Menakaya study was a small retrospective audit study (n = 219 waterbirths), which is generally considered a lower level of evidence.

In their audit, Menakaya observed that 8 waterbirth infants were admitted to the newborn nursery, while only one land birth infant was admitted to the nursery. Admission reasons for the waterbirth infants included four admissions for observation (two required resuscitation at birth, one had an apneic event and low birth weight, and one had mild shoulder dystocia), one admission for meconium aspiration, and three admissions for feeding difficulties. Admissions to the nursery for feeding difficulties were common during parts of the 2000-2009 study period.

There were two very large prospective studies on waterbirth that did not have comparison groups, but reported NICU admission rates for infants born in the water:

- Henderson et al. (2014) reported a 0.5% NICU admission rate out of 1,519 waterbirths.
- Burns et al. (2012) reported a 1.6% NICU admission rate out of 5,192 women who had waterbirths and 3,732 women who labored in water and had land births.

Umbilical cord pH

Higher umbilical cord pH results are considered to be better. Out of the three studies that compared umbilical cord pH levels between waterbirths and land births:

- Geissbuehler et al. (2004) reported a **higher arterial cord pH** in the waterbirth group compared to land births (7.29 vs. 7.27)
- Zanetti-Daellenbach et al. (2007) reported no difference in arterial pH, but a **higher average venous pH** in the waterbirth group than both land comparison groups (7.38 vs. 7.34 and 7.35).
- Thoeni et al. (2005) reported **no difference** in arterial cord pH between waterbirth and land birth

Shoulder Dystocia

Three out of three studies found no difference in the rates of shoulder dystocia between waterbirth and land birth ([Otigbah et al. 2000](#); [Geissbuehler et al. 2004](#); [Zanetti-Daellenbach et al. 2007](#)).

Newborn Infections

Eight studies reported infection rates after waterbirth. Because newborn infections are a rare occurrence, a large sample size would be needed to tell a difference between infections after waterbirths and land births. Because of this, I have bolded the studies with the largest sample sizes.

- **In a study with 3,617 waterbirths, Geissbuehler et al. (2004) reported fewer total newborn infections after waterbirths** compared to land births (0.6% vs 1.0%). There were also fewer newborn eye infections in the waterbirth group compared to

land birth (0.4% vs. 0.8%). There were no differences in maternal infection rates after waterbirth and land birth.

- Thoeni et al. (2005) examined bacteria in the water at two time points during 250 waterbirths: 1) after the initial filling of the tub and 2) after the birth itself. After the tub was filled, rates of contamination were 3% coliforms, 2% *Escherichia coli*, 3% *Pseudomonas aeruginosa*, 2% *Enterococcus sp*, and 12% *Legionella pneumophila*. After the birth, rates of contamination were 82% coliforms, 8% *Staphylococcus aureus*, 64% *Escherichia coli*, 12% *Pseudomonas*, and 11% yeast. After finding these high levels of contamination, the hospital installed bacterial filters. The authors say that this led to a reduced contamination with *Pseudomonas* and *Legionella* in the samples taken immediately after tub filling. However, they do not report the exact levels of contamination that were present after the filters were installed. The high contamination rates in the water did not translate into an increase in newborn infections. Only 1.22% of infants born in the water had clinical signs of infection (“suspect color of the skin, tachypnea”) compared to 2.63% of infants born on land—this was not a statistically significant difference. Levels of C-reactive protein (an indicator of inflammation, which can possibly be associated with infection) were lower in the waterbirth group (1.5 vs. 2.82).
- In a study with 301 waterbirths and 301 land births, Otigbah et al. (2000) found no newborn infections in either group.
- **In a study with 8,924 women who labored or gave birth in water, Burns et al. (2012) reported that 0.39% of the newborns had fever or suspected infection.** However, all of these infants’ lab tests showed no signs of infection.
- In a study with 89 women who had waterbirths, 133 women who labored in water and had land births, 146 women had no water immersion at all, Zanetti –Daulenbach et al. (2007) reported five cases of conjunctivitis in the waterbirth group, 3 cases in the water immersion group, and one case in the no immersion group.
- Mollamahmutoglu et al. (2012) reported that there were no newborn infections out of 207 waterbirths.
- **Out of 1,519 women who had waterbirths, Henderson et al. (2014) reported that three babies were admitted to the NICU with fever or suspected infection following waterbirth.** None of these infants needed any respiratory assistance, and none of them ended up being diagnosed with actual infections.
- Fehervary et al. (2004) compared newborn infection rates between 100 land births and 100 water births, and found no differences in infection rates between groups in the first 6 months after birth.

Group B Strep

There is limited evidence on the relationship between waterbirth and group B strep. In one study (Zanetti-Dallenbach et al., 2007) researchers took nasal and throat swabs from 139 infants who were born in the water and 84 infants who were born on land after their mothers labored in water. The samples were collected within one hour of birth, before washing or any breastfeeding. They also collected samples of pool water after each birth.

About one-fourth of the mothers were positive for Group B Strep, according to swabs done after 37 weeks. The article didn't say whether women received antibiotics, but when I contacted the researchers, they told me that **these women all had antibiotics during labor for GBS.**

The rate of water contamination with GBS was higher in the tubs in which waterbirths had taken place.

However, **infants who were born in the water were less frequently colonized with GBS than those born on land.** Nasal swabs were positive for GBS in 11.7% of the land birth group compared to 1.5% of the waterbirth group. And throat swabs were positive for GBS in 8.4% of the land birth group compared to 1.4% of the waterbirth group.

Although this study seems to support the theory that waterbirth may “wash away” harmful group B strep bacteria, **only a very small number of women were actually GBS carriers in this study.** And these women had antibiotics for Group B Strep. Also, there is a difference between GBS colonization and GBS infection.

It is thought that **GBS infection actually occurs before birth, when the bacteria travel up into the uterus after the membranes are broken.** We would need a very large study to see if there are differences in GBS infection rates between infants born in the water and those born on land. This one small study does not give us that information.

See the [Evidence Based Birth article on Group B Strep](#) to learn more about the difference between GBS colonization and GBS infection.

Note: There is another research study published in 2006 by Zanetti-Dallenbach et al. about Group B Strep and waterbirth. However, the author confirmed to me by email that the 2006 and the 2007 papers reported information from the same group of women, with the only difference being that the 2007 paper has a larger sample size. So that is why I only reviewed the 2007 article.

Newborn Microbiome

In 2004, Fehervary et al. swabbed the palate and ear of newborns immediately after water birth (34 infants), land birth with tub use prior to birth (26 infants), and land birth with no tub use (34 infants).

They found no major differences in bacterial flora between the three groups. The most common bacteria in all three groups were *Staphylococcus epidermidis*, *Escherichia coli*, and *Enterococci*.

Two types of bacteria were observed only after land birth: *Corynebacteriaceae* (5 swabs in the land birth groups) and *Proteus spp* (2 swabs in the land birth groups). Rarely, two types of

bacteria were seen only after waterbirth or water immersion: Group B *streptococcus* (1 swab in the waterbirth group; 1 swab in the land birth with tub use prior to birth group) and *Citrobacter spp* (1 swab in the waterbirth group).

Umbilical Cord Tears

In 2014, Schafer **reviewed all published cases of waterbirth umbilical cord tearing**. An umbilical cord tear is also called umbilical cord “snap,” “rupture,” or “avulsion.” Based on their review, they estimated that there are **about 3.1 umbilical cord snaps per 1,000 waterbirths**.

Out of all the cases of umbilical cord snap, about 23% lead to NICU admission, 13% lead to the need for a newborn blood transfusion, and there have been no reports of any long-term harmful effects.

Burns et al. ([2012](#)) reported 20 umbilical cord snaps in a study with 5,192 waterbirths and 3,732 land births where women left the tub before giving birth. Eighteen out of these twenty snaps occurred during waterbirth.

Unfortunately we cannot compare the overall numbers of umbilical cord snap between waterbirths and land births, because other than the Burns et al. ([2012](#)) study, there have been no studies that describe how frequently umbilical cord snaps happen on land.

Newborn Resuscitation

No researchers compared rates of newborn resuscitation between waterbirth and land birth.

Other Frequently Asked Questions about Waterbirth

Why do women leave the tub?

In a large Italian study, 36% of women who entered the tub left before the birth, mostly **at their own request, or for slow progress in labor or fetal heart rate abnormalities** ([Henderson et al. 2014](#)).

In another large prospective study that took place in the United Kingdom, 42% of women who entered the pool left before birth, mostly for the **need for additional pain relief or slow progress in labor** ([Burns et al. 2012](#)).

Does getting in the water too early slow labor down?

There are reports of women leaving the tub because of slow progress in labor ([Henderson et al. 2014](#); [Burns et al. 2012](#)). However, **there is no evidence-based rule as to the best time to get in the tub**.

The “four centimeters” cut-off seems to be an **arbitrary guideline** that does not have evidence to back it up yet. In the research evidence we have on waterbirth, some researchers told women not to get into the tub until “active labor,” but most researchers didn’t say when women were encouraged to get in the tub.

Is it okay for the partner to get in the tub?

There is no research evidence on this practice.

What is the best water temperature for the different stages of labor?

The only evidence we have on water temperature comes from one case report. In this report, physicians found higher fetal heart rates in several women who had too warm of a bath. Most of the women got out of the tub, and the fetal heart rates slowed down. One woman stayed in the tub, and after the water temperature was lowered, the fetus’s heart rate went back down to normal ([Rosevear et al. 1993](#)).

It is also thought that the water temperature **should not be allowed to cool** down at the time of birth, because based on lamb studies, it is thought that cooler temperatures might stimulate the infant to breathe before its face is brought up into the air ([Johnson 1996](#)).

Based on this information, and consistent with other published guidelines, researchers recommend that the water temperature should never be greater than 100 degrees Fahrenheit (37.5 C) and may be adjusted according to the mother’s preference within a narrow range of 98.0 to 100 degrees Fahrenheit or 37.0 to 37.5 Celsius ([Nutter et al. 2014b](#)).

Is there any research on waterbirth for Vaginal Birth after Cesarean (VBAC)?

There is little to none. Most of the research studies on waterbirth excluded women who were having VBACs. I came across one study that reported that some of the women in the sample had waterbirth VBACs ([Thoeni et al. 2005](#)). However, because there were only 60 women who had VBACs in the water, the numbers are too small to draw any conclusions.

In 2006, Garland published a small clinical audit in MIDIRS Midwifery Digest about the use of water immersion during VBAC (Garland 2006). Out of 92 women who were interested in a VBAC waterbirth, only 15 women labored in the water, and only four women actually remained in the water for the birth. So this audit is too small to give us information on the safety of VBAC waterbirths.

What makes the risk of cord tearing likely greater in waterbirth than on a land birth?

Researchers have hypothesized that **there may be an increased risk of cord tearing from unnecessarily rapid or extra forceful traction on the cord as the baby is lifted out of the water.** It is important for midwives to learn how to avoid excess traction as they calmly help the mother guide the baby's head out of the water.

In their review on umbilical cord tears, Schafer ([2014](#)) suggests there is a strong instinct to bring the baby out of the water immediately after birth, which can lead to rapid cord traction without regard for cord length or tension.

Cords may tear if they are too short to reach the surface of the water, or if too much traction was placed on the cord. If the cord does tear and it is diagnosed right away, the care provider can clamp the newborn's cord quickly enough to avoid excess blood loss.

In the small number of cord snaps that have been documented in waterbirths, there is a relationship between delayed recognition of the cord tear and newborn bleeding. If the water is cloudy after birth, the limited visibility might prevent a midwife from noticing the newborn bleeding from a torn cord. In these cases the delay in diagnosis led to excess blood loss.

Recommendations for **preventing cord tears** include:

- Recognize the potential for umbilical cord tears.
- Be familiar with the signs that it has occurred.
- Lower the water level slightly just before birth so that the baby does not have to travel as far to get out of the water, but keep the water level high enough so that the entire baby can be born underwater.
- Have cord clamps immediately available in case the cord tears.
- Assist the mother in bringing the newborn to the surface calmly and gently.
- Avoid excess cord traction.
- Thoroughly examine the newborn and cord immediately after birth.

What are the contraindications for waterbirth? Do only low-risk women benefit or would certain high risk groups benefit too?

There is little-to-no research evidence to guide the contraindications—most of this is based on clinical opinion.

However, most studies out there have used the guidelines of “37+ weeks, head down, single infant with no medical complications,” and have had very good results for mothers and infants.

I have listed below some of the common criteria that are sometimes used to risk a woman out of waterbirth, along with the little evidence that we have:

- Hypertension—Water has been shown to lower blood pressure, and water immersion during labor may be helpful to bring down a high blood pressure ([Cluett and Burns 2009](#)). However, no researchers have looked at whether it is safe for women who have high blood pressure to have a waterbirth.
- Meconium—Typically, women who have meconium-stained waters are asked to leave the tub prior to birth. It is thought that meconium may indicate a stressed baby who might be more likely to gasp underwater ([Nutter et al. 2014b](#)).
- High body mass index—There really no evidence to guide this issue. Keeping heavier women from having waterbirth comes from the clinical opinion that it may be more difficult to help a heavy mother out of the tub if there is an emergency. However, it is important to remember that these mothers are not medicated and may feel lighter since water creates buoyancy. The buoyance and the fact that the mother has not had pain medication may help her make movement and position changes more easily ([Stark et al. 2008](#)).
- Twins and breeches—These populations are typically excluded from waterbirth studies, so there is little-to-no data on the safety of waterbirth for twins and breeches. In 1995, one physician proposed that breech is an indication for waterbirth because the water helps prevent premature urges to push, and there may be cord protection and better temperature maintenance in the water (Ponette 1995). However, this theory has not been tested by research.
- Ruptured membranes—women with ruptured membranes have usually been included in waterbirth studies (see [Annotated Bibliography](#)), so the evidence that we have on the safety of waterbirth probably applies to them, too.
- Gestational diabetes and diabetes—these women may be asked to leave the tub because of a higher risk of shoulder dystocia (shoulder getting stuck behind the pubic bone) if there has been poor control of blood sugars, excessive weight gain, or a large infant is anticipated. However there is no evidence that looks at whether it is easier to manage shoulder dystocia in the tub or on dry land. Some midwifery guidelines recommend having the mother change positions in the tub in the event of a dystocia. If that does not immediately resolve the problem, the mother can be asked to leave the tub so that the midwife can perform additional maneuvers ([Nutter et al. 2014b](#)).

What impact does waterbirth have on the baby’s temperature regulation?

I could not find any evidence on the baby’s temperature regulation after waterbirth.

Is the tap water different from the amniotic environment, and how could this affect the baby?

Tap water is more hypotonic than amniotic fluid. Because of this, many years ago, a physician proposed that maybe salt should be added to the tub water, but this was never put into practice ([Barry 1995](#)).

Is there any evidence that a woman can get a water embolism if the placenta is birthed in the water?

In 1983, Dr. Odent mentioned this as a hypothetical risk, but no cases have ever been described.

What is the mother's experience with waterbirth?

So far there have been two qualitative studies published on mothers' experiences with waterbirth.

In *qualitative studies*, we get rich, descriptive information about an experience from in-depth interviews with women who have experienced waterbirth. Information from qualitative studies is less able to be generalized (because of the small samples sizes), but it gives us a deeper insight into what these women experienced.

Why do women seek waterbirth?

In a qualitative study that took place in Taiwan during 2001-2002, researchers interviewed nine women who had a waterbirth to better understand why women chose waterbirth ([Wu and Chung 2003](#)). The women in this study chose waterbirth for three main reasons:

1. **Women were not satisfied with other labor and delivery options.** Women disagreed with the high rates of Cesarean and other interventions that took place in the hospital, such as forceps deliveries, episiotomies, IV medications, not being allowed to eat or drink, and bans on vaginal birth after Cesarean. Women said that they felt like the current maternity care system treated them like objects in a factory line. Those who had given birth before described negative birth experiences, where their feelings and emotions were neglected; they were threatened, had painful unnecessary C-sections, or in general received a lack of up-to-date, evidence-based care.
2. **Women wanted to demonstrate their autonomy.** Women chose a childbirth method that was outside of the system. They described wanting to escape the "domination" of the obstetricians in the hospitals. Women researched midwifery care and waterbirth and had confidence in these options; they trusted their midwives.
3. **Family support, especially from the husband, was very important as the mothers planned their waterbirth.** However, some relatives had worries or objections, and wanted the mother to birth in a hospital. The mothers employed several strategies to achieve their goal of a waterbirth with or without their family's support. They explained the benefits of

waterbirth to their relatives, and they gave written materials on waterbirth to their husbands. Some mothers hid their decisions from relatives and only told them about the waterbirth after their baby was born.

What do women like about waterbirth?

In 2003, a researcher conducted a study with 170 mothers who had experienced waterbirth at five birthing centers in England during the years 1993-1994. The mothers were asked to respond to a written survey about their experience with waterbirth ([Richmond 2003](#)).

- In their responses, **the majority of women described their waterbirth as “quite pleasurable” or “very pleasurable and fulfilling.”** Mothers chose waterbirth because it seemed natural, they thought it would be less painful for them and make for a more gentle birth for the baby, and because they wanted a drug-free labor. Other pain relief methods that were used in addition to the water were TENS units (20%) and gas (88%). Most women (81%) were in favor of having another waterbirth in the future.
- When asked to describe their feelings when they entered the pool, mothers used the words *relaxation, relief, pain relief, warmth, buoyancy, control, and calming*. When women who had given birth before were asked to describe how their waterbirth was different from previous births, mothers said they felt more in control, and that the waterbirth was more relaxing and less painful. They felt calmer, more satisfied, and many mothers felt their labors went faster in the water.
- When asked which factors made them like waterbirth better than other methods of birth, mothers frequently said that it was: *more relaxing, it calmed me, weightlessness/buoyancy helpful, soothing, felt supported by the water, able to hold baby immediately, no one took the baby, and felt more in control*.
- Only a minority of women voiced dislikes about waterbirth. A small number of women said that they got cold or the baby got cold, that their contractions went away, or that staff was not supportive.
- Two-thirds of the mothers commented that **the most memorable experience of waterbirth** was that **no one took their babies away from them immediately after birth**.

Why doesn't the newborn breathe underwater during a waterbirth?

Most of our knowledge related to this topic points back to a classic research article published in 1996 by Johnson, a physiologist ([Johnson 1996](#)).

Johnson explained that before birth, fetal breathing movements occur about 40% of the time. These fetal breathing movements are blocked at the larynx (voice box) during inspiration, and partially blocked during expiration. Normally, very little amniotic fluid is actually inhaled with these breathing movements while the baby is still in utero.

About 48 hours before spontaneous labor, these “practice” fetal breathing movements stop—possibly because of a surge in levels of a hormone called prostaglandin E2 ([Johnson 1996](#)).

When an infant is born in the water, researchers have proposed several factors that prevent the newborn from inhaling water:

- Skin receptors on the face have not yet come into contact with air ([Harned et al. 1970](#))
- Endorphins are released by the brain ([Johnson 1996](#))
- Hormones (including prostaglandins, progesterone, estrogen, and adenosine) are released by the placenta ([Johnson 1996](#))
- A warm temperature of about 37 degrees Celsius ([Johnson 1996](#))
- Mildly low oxygen levels ([Johnson 1996](#))
- Chemical receptors detect water and close the airway (the so called “dive reflex”) ([Johnson 1996](#))

Factors that help stimulate breathing:

- Facial skin receptors come into contact with oxygen and carbon dioxide in the air ([Harned et al. 1970](#))
- Cooler temperatures ([Johnson 1996](#))
- Severely low oxygen levels (can lead to gasping) or high levels of carbon dioxide ([Johnson 1996](#))
- Morphine-type drugs can override the dive reflex, and it is recommended that narcotics should be avoided for a minimum of four hours before birth ([Nutter et al. 2014](#))

It is thought that prevention of breathing during a waterbirth can be overridden by chronic health changes, severely low oxygen levels, and drugs such as those used to induced labor ([Johnson 1996](#))

What rare adverse events have been seen in case reports?

A number of researchers have published case reports of individual infants who have had adverse effects possibly caused by waterbirth—and in some cases definitely caused by waterbirth.

The authors of the ACOG/AAP opinion statement relied almost solely upon case reports to describe waterbirth as dangerous. However, case reports are considered the lowest level of medical evidence.

It’s important to understand that there are different types of case reports. When a case report is formally published as a peer-reviewed article in a scientific journal, it is called a **case study**. Case studies are used to describe a rare event in great detail so that other health care professionals can learn from that rare event. However, some case reports are published as **letters to the editor**. These brief letters to the editor are not peer-reviewed. They often lack enough detail to get a clear picture of what really happened.

The **pros of case reports** are that they allow us to take an in-depth look (or brief look, in the case of letters to the editor) at a rare event. We can learn lessons from the case study that can help us improve the quality of care for women and infants in the future.

The main **drawback of case reports** is that they are not a systematic research study. Case reports are considered one of the lowest levels of research evidence. When researchers publish a case report of a rare event, there is no way for us to know how often an event like that has occurred. Also, some of the case reports about waterbirth are incomplete—they barely give us any information about the type of care the woman and infant received during the waterbirth.

To help you understand the case reports that have been published on waterbirth, I have made a table below with their findings. To read more details about the case reports, you can download the annotated bibliography here: <https://gum.co/waterbirth>

Table 2: Case Reports on Waterbirth

First Author	Type of Report	Country	Case	Note
Rosser (1994)	Magazine article	The cases took place in Austria, England, and Sweden	This magazine article described 3 stories about newborn drownings: 1) The parents did not remove the infant from the water until 25 minutes after the birth, 2) An infant was born on dry land but still inside the membranes, and the parents did not know how to remove the infant from the membranes, 3) A baby died after a home waterbirth attended by 2 experienced midwives. The baby showed no signs of stress during labor, but was born with severe respiratory distress and made breathing movements	This article was not a case report but was a magazine story. It was cited as case report evidence of two “waterbirth drownings” in the Pinette et al. 2004 review article entitled the “Risks of underwater birth,” published in the <i>American Journal of Obstetrics and Gynecology</i> .

			as it came up to the surface.	
Rawal (1994)	Case report	England	A male infant was born at term and developed a <i>Pseudomonas</i> blood infection after a hospital waterbirth. Culture samples from the birthing tub, filling hose, taps, exit hose, and disposable lining of the tub all grew <i>Pseudomonas</i> . Within two days he made a complete recovery, and he was discharged after being treated with antibiotics for seven days.	The authors stated that there should be regular laboratory testing of birthing tubs and strict infection control policies. Before this case, their hospital policy was to wash the system with hot water and detergent and allow it to dry after each birth. Now, they take cultures from the birthing tub system after each water birth, keep the filling and exit hoses short, and heat-disinfect the hoses after each use.
Barry (1995)	Letter to the editor	England	After a waterbirth, the newborn had some difficulty breathing and a seizure. A laboratory work-up revealed hyponatremia (low sodium levels). It was thought that the hyponatremia may have been due to inhaling fresh water.	No other details were provided about the infant or the birth.
Hagadorn (1997)	Abstract	U.S.	A male infant was born at 38 weeks in a waterbirth in a disinfected outdoor hot tub at home, attended by a midwife. He was admitted to the NICU shortly after birth for respiratory distress. Chest x-ray showed	The infant's final diagnosis was aspiration pneumonia, which contributed to a surfactant deficiency, and incidental colonization of the trachea with <i>B picketti</i> . The organism was not the cause of

			<p>fluid in the lungs, and he was intubated at 16 hours of age and received 3 doses of surfactant, after which his breathing improved. Cultures of a specimen from his trachea grew “scant but pure growth” of <i>Berkholderia picketti</i>, an organism usually found in water. The <i>Berkholdia picketti</i> was not present in any cultures of the hospital water. Cultures later taken from the tub in which the infant was born grew <i>Berkholderia picketti</i>. The infection did not spread to the baby’s bloodstream. He remained on a ventilator for 5 days, had 14 days of antibiotics, and his symptoms resolved completely.</p>	<p>the respiratory symptoms—however, the fact that the same rare organism was present in the tub and present in his trachea “is compelling evidence that he aspirated tub water during the delivery.”</p>
Parker (1997)	Letter to the editor	U.S.	<p>A female infant who was born in the water at 37 weeks gestation, attended by a CNM. At age 19 days, the infant presented with a one-week history of yellow drainage from the right ear. The infant was alert, vigorous, and had no fever or any other signs of illness. The ear drum was ruptured and the culture was positive for <i>Pseudomonas</i> and rare <i>E coli</i>. The</p>	<p>It is not clear whether the facility was a hospital or birth center. No culture or lab samples were available from the birthing tub where the infant was born. The facility closed before this letter to the editor was written.</p>

			<p>infant's blood cultures were positive for <i>Pseudomonas</i>. The infant received two weeks of intravenous antibiotics and had a normal follow-up one month after completion of therapy.</p>	
Vochem (2001)	Case report	Germany	<p>A 23 year old mother took a 30-minute tub bath at term. Later that day she gave birth to a male infant, on land. At 11 days, the baby was not feeding well, was lethargic, and had seizures. He was diagnosed with <i>Pseudomonas aeruginosa</i> meningitis and underwent immediate treatment with antibiotics. At nine months of age, he has normal psychomotor development. <i>Pseudomonas</i> bacteria cultured from the shower tubing at home were genetically identical to bacteria present in the infant's cultures.</p>	<p>This was not a waterbirth, although it is cited as a complication of waterbirth in the Pinette et al. (2004) review article published in the <i>American Journal of Obstetrics and Gynecology</i>. It is impossible to tell if the infant was contaminated because of the mother's tub bath before giving birth or if he was contaminated at some other point prior to developing meningitis at 11 days of age.</p>
Nguyen (2002)	Case study	New Zealand	<p>Four infants who experienced complications from water birth and were transferred to their facility:</p> <ol style="list-style-type: none"> 1. An infant with respiratory distress was transferred to their facility after 	<p>It is not clear whether the infants were born at home or in the hospital, and it is possible that several of the births were unattended. The authors provided no information on</p>

			<p>an accidental waterbirth. The mother initially hid the waterbirth from the providers. The infant was thought to have aspirated water but made a complete recovery.</p> <p>2. After a waterbirth, an infant developed respiratory distress at 6 hours and was transferred to the NICU. The mother initially hid the water birth. Chest x-ray showed fluid in the lungs. The infant made a complete recovery within 24 hours.</p> <p>3. The third infant was born at term during a planned waterbirth. He was vigorous at birth but needed resuscitation at 5 minutes of age. Chest x-ray showed fluid in the lungs. The infant made a rapid improvement over 24 hours.</p> <p>4. The fourth infant was born at term during a planned water birth, had normal Apgars, but developed respiratory distress at 10 minutes and needed respiratory support. Chest x-ray showed fluid in the lungs. The</p>	<p>whether safety procedures were followed during the waterbirth; for example, it is not known how long the infants were submerged in the water before being lifted up to the surface. They also did not report water temperature.</p>
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			infant improved dramatically over 24 hours.	
Bowden (2003)	Letter to the editor	U.S.	<p>1. A 37-week gestation male infant was born in a hospital tub. Water inhalation was suspected but not confirmed.</p> <p>2. A male infant born at home in a bathtub, developed seizures at 8 hours of age, and was diagnosed with hyponatremia and probable water intoxication.</p> <p>3. A female infant, born in the water in a hospital tub, was diagnosed as having no left lung, no left kidney, and a heart defect.</p> <p>4. An infant born at home in a bath tub was admitted at 4 days of age with group B strep meningitis.</p>	Only the first two cases appear to be related to water birth. The authors did not present the cases thoroughly. It is not known whether the cases reported are directly due to the water birth, or if standard safety procedures were followed. No other details about these births were provided, including whether or not the infants recovered.
Nagai (2003)	Case report	Japan	A 42-week infant girl was born unassisted (no midwife present) in a bathtub in her home. The home was installed with “ever-ready” hot water system in which hot water is always circulating through the plumbing. The infant had a normal assessment at birth but developed a fever and jaundice on day 4 of life. She was admitted to the	The authors attribute this case to the 24-hour “always ready” bathing system. In these systems, the same water is used over and over for days or months, and kept at a warm temperature. Even though the water may be filtered, heated, chemically disinfected, or have UV light disinfection, some organisms may

			hospital for phototherapy and discharged the next day. On day seven the infant was vomiting and had a fever, and the next day she stopped breathing. She was transported to the emergency room, where she was unable to be resuscitated. An autopsy showed <i>Legionella</i> lung disease. In an environmental investigation, the bathtub laboratory tests were positive for numerous <i>Legionella</i> .	survive. The water may be clean enough for normal bathing, but it is not clean enough for drinking or use by newborn infants.
Franzin (2004)	Case study	Italy	A newborn developed <i>Legionella</i> pneumonia 7 days after a hospital waterbirth.	The entire hot water supply of the hospital was positive for <i>Legionella</i> , and the bacteria were present in very high numbers.
Kassim (2005)	Case study	United Kingdom	A 40-week gestation infant developed respiratory distress after a hospital waterbirth. The baby did not need resuscitation at birth, but at one hour he was grunting and was admitted to the NICU with respiratory distress. A chest x-ray showed changes consistent of aspirating water. The infant made a complete recovery.	The authors did not report whether standard safety procedures were followed during the waterbirth.

Byard (2010)	Case study	Australia	A 42-week gestation infant died of meconium aspiration and <i>Pseudomonas</i> pneumonia after a home waterbirth.	The <i>Pseudomonas</i> infection was thought to have come from the birthing pool, although no laboratory tests were done on the pool or water.
Dressler (2011)	Case study	Germany	The authors described three drownings: two after waterbirth and one after a shower birth. In all three cases, the drownings were likely intentional, although investigators were not able to prove it. All three women had hidden pregnancies, had no prenatal care, had unassisted births, and one of the women did not even know she was pregnant when she birthed into the tub.	These were criminal cases in which mothers were thought to have intentionally drowned their newborns.
Soileau (2013)	Case report	U.S.	A female infant was born at 40 weeks and 4 days via a planned waterbirth at home. The mother had diarrhea and a low-grade fever for one week before giving birth. She had a bowel movement in the water prior to the baby's birth. The infant was healthy until 4 days of age when she developed a fever, was hospitalized, and diagnosed with sepsis and adenovirus. The infant's condition	Newborn adenovirus infections are very rare and few cases have ever been described. It is thought that the mother typically transfers immune protection for adenovirus to the fetus through the placenta, which is why newborns do not usually get this illness. The authors propose that this newborn's infection was transmitted during the waterbirth since the

			grew worse and she died shortly after the parents decided to withdraw medical support. Autopsy results showed adenoviral pneumonia, bleeding in the colon, and multi-organ failure.	mother had an infectious bowel movement (diarrhea) in the water bath immediately prior to delivery. Because the water was heavily contaminated, this increased the newborn's risk of contact with the virus.
Schafer (2014)	Systematic review of all case reports of umbilical cord tears during waterbirth	N/A	The authors reviewed all published cases of waterbirth umbilical cord tearing. An umbilical cord tear is also called umbilical cord "snap," "rupture," or "avulsion." Based on their review, they estimated that there are about 3.1 umbilical cord snaps per 1,000 waterbirths. Out of all the cases of umbilical cord snap, about 23% lead to NICU admission, 13% lead to the need for a newborn blood transfusion, and there have been no reports of any long-term harmful effects.	The authors provided a list of guidelines that can be used to prevent and treat umbilical cord tears. It is impossible to compare the rates of umbilical cord tears between waterbirth and land birth because researchers have not recorded how often cord tearing occurs during land births.

What can we learn from these case studies?

If you read all of these case studies, **most of the authors do not call for a ban on waterbirths.**

Instead, they **make recommendations to improve safety and informed consent**. Some of their recommendations are:

- *Pseudomonas* is found in water reservoirs both in hospitals and in the community, and it can cause severe infections in newborns. Plastic tubing is the perfect environment for *Pseudomonas* to grow, especially if the strain of bacteria is resistant to disinfectants (Vochem et al. 2001). Providers who offer waterbirth in facilities may want to take cultures from the birthing tub system after each water birth, shorten the filling and exit hoses, and heat disinfect the hoses after each use (Rawal et al. 1994)
- Track outcomes in hospitals that provide waterbirth as an option ([Nguyen et al. 2002](#))
- Track infection rates of mothers and infants, and have policies in place to prevent infections, such as pool maintenance, decontamination for bacteria, and universal precautions (Franzin et al. 2004)
- As part of the informed consent process, inform pregnant mothers who are interested in waterbirth that although very rare, it is possible for infants to try to breathe under water, even if they only have a very brief submersion (Hagadorn et al. 1997)
- Caution should be used if a mother with a recent diarrheal illness is considering a water birth ([Soileau et al. 2013](#))

Are breathing problems after a water birth similar to breathing problems after a land birth?

Newborns can sometimes have problems breathing or fluid in their lungs after birth. In 2012, researchers from New Zealand ([Carpenter and Weston 2012](#)) tried to **determine whether breathing problems and fluid in the lungs look the same after waterbirths and land births**.

In a retrospective case-control study, they collected medical records and X-rays for two groups:

1. 14 infants who had breathing problems after waterbirth between the years 2000-2006.
2. 24 infants (matched group) who had breathing problems after a land birth.

The X-rays were reviewed by 25 volunteers who were blinded to whether the baby was born in water or on land. The volunteers included 11 neonatologists, six neonatal trainees, six neonatal nurse specialists, one radiologist, and one pediatrician.

Their findings?

Less than half (42%) of the health care professionals accurately picked whether the X-ray came from a baby born in the water or on land.

An equal number of professionals rated the X-ray as “don’t know” for land birth and water birth babies (27% vs. 27%).

Land birth babies were more likely to be correctly recognized than waterbirth babies (59% vs. 38%). Also, **a higher percentage of waterbirth babies were more likely to be graded as having “severe” respiratory changes compared to land birth babies (48% vs. 16%).**

When they compared medical records of the waterbirth and land birth babies, the only differences between these two groups was that more water birth babies had to go on a ventilator (4 vs. 0).

There were no differences between groups in birth weight, gestational age, Apgar scores at 1 minute, heart rate at 6 hours, respiratory rate at 6 hours, age at first feed, time on respiratory support, or length of NICU stay.

The researchers concluded that although breathing problems that may occur after water birth are similar to breathing problems that may occur after land birth, the X-rays are more likely to be graded as having severe changes. They suggested that this study be repeated in other settings, and that researchers should collect an accurate denominator so that we can learn how often breathing problems happen after waterbirths compared to land births.

What research is needed?

Overall, **there is a need for more evidence to support waterbirth practice.** Hospitals, birth centers, and providers who offer waterbirth should consider participating in the American Associations of Birth Centers (AABC) research registry.

The AABC registry collects prospective data on women who are planning waterbirths. To learn more about joining this study, click [here](#).

Hint: Many midwives have found that their hospitals count enrolling in the AABC registry as fulfilling the ACOG/AAP recommendation for waterbirth to only happen in a clinical trial.

When studying waterbirth, **researchers need to conduct large, high quality prospective research studies with appropriate comparison groups**, if possible.

The ideal comparison group would be made up of women who are interested in waterbirth and eligible for a waterbirth, but for whom a tub is not available.

We also need researchers to look at the following issues:

- Is it better to birth the placenta in or out of the tub?
- What is the best way to estimate blood loss in the water?
- How does waterbirth affect the infant microbiome, breastfeeding rates, newborn temperatures, mother-infant bonding, and newborn behaviors such as crying?

- What is the evidence for exclusion criteria used for waterbirth? For example, many providers exclude women who are overweight or obese from waterbirth, but what is the evidence for this practice?
- Is birth in water safe for women planning VBACs?
- What are the best infection control policies?
- What are the differences between babies born on land who develop fluid in the lungs, and babies born in water who develop fluid in the lungs? [Replication of the Carpenter and Weston (2012) case control study]
- What is the experience of a modern-day mother during waterbirth? (Qualitative research)
- How many women have access to waterbirth? What are the barriers to access?
- What are the best ways for midwives, nurses, and physicians to train in waterbirth techniques?
- What is the economic impact of using waterbirth?

What are the pros and cons of waterbirth?

Despite ACOG/AAP's statement that waterbirth carries no benefits, research evidence actually shows there are some potential benefits associated with waterbirth.

Pros of waterbirth

- Lower rates of episiotomy
- Higher rates of intact perineum
- Possibly lower rates of 3rd or 4th degree tears
- Possibly lower rates of postpartum hemorrhage
- Less medication use for pain relief—this may be important for women who want or need to avoid epidurals or narcotic medications during labor
- Possibly fewer NICU admissions after waterbirth (it is not known whether the lower NICU admission rates are due to waterbirth itself or because women are asked to leave the tub for the birth at the slightest hint of problems with the fetal heart rate)

Cons of waterbirth

- There is a higher rate of 1st and 2nd degree perineal tears in waterbirth, but that is because women in the water may have natural tears instead of episiotomies
- We need more research evidence on waterbirth (in particular, research studies with appropriate comparison groups). So this makes it more difficult to make a truly informed choice.
- Umbilical cord tearing is a rare but possible occurrence. Care providers need to take care not to place too much traction on the cord when guiding the infant out of the water.
- There have been several case reports of water aspiration, but these cases have not been observed in any prospective research study since 1999, and nearly all of the infants in the case reports made a complete recovery.

- Although large research studies have not shown any increase in the risk of infection, there have been several case reports of infections after waterbirths. This risk can be lowered by regularly culturing the hospital water supply, hoses, and tubs, and by installing filters when necessary.

What is the bottom line?

New research evidence on waterbirth is continuing to emerge.

For women, there are several benefits associated with waterbirth. There is strong evidence that waterbirth is associated with a lower episiotomy rate, and that women who use waterbirth will have higher rates of intact perineum and use less medicine for pain relief.

The benefits or risks for the newborn are less clear, but so far the evidence shows **fewer or equal NICU admission rates** for waterbirth babies compared to babies born on land. **There have been rare case reports of breathing problems or infections in infants after waterbirth,** but these risks have not been seen in the large, recent, prospective studies on waterbirth.

The ACOG/AAP opinion statement on waterbirth contained major scientific errors and was an inaccurate and incomplete review of the literature. Their opinion statement should not be relied upon to make informed decisions about the availability of waterbirth for women.

Based on the data that we have, **waterbirth is a reasonable option for low-risk women during childbirth, provided that they understand the potential benefits and risks.** If women have a strong desire for waterbirth, and there are experienced care providers who are comfortable in attending waterbirths, then at this time there is no evidence to deny women this option of pain relief.

Although we need more research on waterbirth, the available research shows that **universal bans on waterbirth are not evidence-based.**

Free Resources:

- The ACNM created a **two-page handout on waterbirth, written for women and families.** To access this printer-friendly PDF handout, click [here](#).
- The Royal College of Midwives released a response to ACOG/AAP Opinion Statement. To access this printer-friendly Word document, click [here](#).
- The [American Association of Birth Centers released an Opinion Statement and preliminary data on the safety of waterbirth in U.S. birth centers.](#) To access this printer-friendly PDF, click [here](#).
- The United Kingdom National Health Services publishes guidelines for waterbirth in the hospital and at home. To access the PDF, click [here](#).

Other Resources

- A 2014 article in the Journal of Midwifery and Women's Health contains information about waterbirth fundamentals for care providers, a sample informed consent document, and a sample hospital policy. Available with some medical library subscriptions (check with your institution) or for purchase. Click [here](#).
- In the process of writing this article, I purchased several waterbirth books from Amazon. By far, **the most evidence-based book that I read was Diane Garland's "Revisiting Waterbirth: An Attitude to Care."** It was originally written for midwives, but highly-motivated mothers will also find this book helpful. Click [here](#).
- Waterbirth International holds on-site trainings for hospitals who want to offer waterbirth. Click [here](#), or email info@waterbirth.org for more information.

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Read an interview with the author!

Click [here](#) to read an interview with Rebecca Dekker, PhD, RN, about what it was like to write this article.

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