

A Retrospective Study of Maternal and Neonatal Outcomes Following Conventional and Water Birth in Ecuador

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Abstract

Objectives: Demonstrate maternal and neonatal complications reported in women giving birth in water birth compared to those conventional land births.

Methods: An observational retrospective analysis of the incidence of maternal and neonatal outcomes among 358 women who deliver their newborns throughout conventional vaginal delivery and 308 women giving birth in water during 2013 in Quito, Ecuador. Maternal Age, Educational attainment, Neonatal weight, height, APGAR scores, vaginal tearing and the need to resuscitate a newborn were the variables matched for both groups.

Results: Among 308 women who were scheduled to deliver their newborns in water, 73% successfully culminate in water vaginal births while 26 % required a C-section. Among the conventional birth group, only 47% ended their pregnancy vaginally as planned and 53% required a C-section.

The use of oxytocin (RR: 12.9 CI 7.9 to 20.9 p<0.0001) and intentional episiotomy (RR: 13.9 CI 5.1 to 37.9 p<0.0001) are much higher among conventional birth, however, the risk to have a vaginal tearing during water labor is 3 times higher than conventional birth (RR: 2.9 CI 2.12 to 4.2 p<0.0001). In the conventional delivery cohort 3 neonatal deaths were reported while water birth no deaths reported, however, no causality of these deaths was explored due to the absence of information.

Conclusions: We conclude that water birth is an effective method to deliver children as long as there is an adequate understanding of the risk and benefits of this procedure. Planning a water delivery seems to reduce the risk of using prophylactic uterotonic medication, prophylactic episiotomies and to perform unplanned C-sections. Due to higher incidence of vaginal tears, strict perianal protection during the third stage of labor is recommended.

Keywords: water birth, cesarean section, maternity, immersion

1. Introduction

Birth rates vary from country to country and the method of delivering children is highly influenced by socio-demographic characteristics, education attainment of the mother, cultural traditions as well as the proper access to health infrastructure (Sandelowski & Bustamante, 1986; Chong & Mongelli, 2003; Fawcett, Pollio, & Tully, 1992; McCourt et al., 2007; Hou et al., 2014).

In some cultures, women's anxiety, fear of pain or postpartum complications as well as other socio-demographic variables such as misuse of private insurance, economic interests from hospitals and physicians have been linked to the current trends in C-Section rates when compared with traditional vaginal births in some countries (da Gama et al., 2014; Feng et al., 2012; Gibbons et al., 2010; Potter et al., 2001).

Vaginal delivery has several benefits over less traditional methods such as a C-sections including reduced costs and hospital stay after birth, faster recovery, facilitates expulsion of fluids from the newborn's lungs, reduced risk

to exposing the child to anesthetic agents and accelerated contact between the mother and the newborn among other benefits (Gregory et al., 2012; Jain & Eaton, 2006).

Promoting early physical contact between the mother and the newborn, involving the father during labor, reducing stress to the mother and the newborn and respecting women's right to decide the way their give birth are factors that have gain importance in the last decades (Mabuchi & Fustinoni, 2008; Kukla et al., 2009).

Giving birth is not always a natural the natural process that used to be, nowadays, hospitals are crowded and there is little participation of the father during labor, being these some of the factors affecting the increasingly higher rates of C-Sections worldwide (Gregory et al., 2012).

Giving birth in water (pool birth or underwater birth) has become an important alternative for those women seeking to deliver their children in a more intimal and respectful way, many times at home (Sister Morning Star, 2015).

Water birth was first described in the medical literature in 1803, where a group of doctors reported that a woman with prolonged labor delivered her child after water immersion (Pinette, Wax, & Wilson, 2004).

Delivering children in water has some well described beneficial effects over traditional births, specially reducing labor time, reducing pain, improving venous return and increases edema mobilization (Katz et al., 1992). Some other benefits include better perineal muscle relaxation, greater feeling of control and safety over the situation, less abrupt and better transition from the uterus to the environment and a significant risk reduction of vaginal tearing (Dahlen et al., 2013; Shorten, Donsante, & Shorten, 2002; Edlich et al., 1987).

Although this method has become an accessible alterative for a group of women worldwide, very few reports have explored the prevalence of water birth worldwide. In 2004, Woodward et.al reported that from 1985 to 1999 a total of 150,000 births were performed underwater; however, no regional analyzis have been published as far as we know (Woodward & Kelly, 2004).

Despite the fact that some benefits have been clearly stablished, there are also some negative events that have been reported. The majority of information came from case reports, describing postpartum waterborne infections, hypothermia, aspiration, delayed thermoregulation, rupture of the umbilical cord, nearly drowning experiences, suffocation and even death (Pinette, Wax, & Wilson, 2004; Thoeni et al., 2005; Gilbert & Tookey, 1999; Nguyen et al., 2002; Nagai et al., 2003).

Although these risks are similar to the ones found during normal vaginal deliveries, the immersion factor might be responsible to the negative interest many times attributed to water birth (Byard & Zuccollo, 2010).

A deeper analysis of the risks attributed to this procedure was undertaken by the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists as well as the Spanish Society of Neonatology and the Spanish Society of Obstetrics and Gynecology, they have recently published their guidelines of water birth (Swain, 2013; Nutter et al., 2014; Poder & Larivière, 2014; Iriondo Sanz et al., 2015).

Although some clinical trials and other reports have explored the benefits and risk of water birth, more information originated in developing countries is not available.

In south America for example, there is no water birth guidelines and the majority of information arrived from the relatively few scientific reports available (Wagner, 2001; Cárdenas et al., 2013).

In Ecuador, although at least 3 centers are offering this service no data have been published. It is estimated that at least 600 children are born in water annually, even thought regulation is not available, having evidence locally collected is important in order to make the best clinical decisions.

This study aims to describe the incidence of maternal or fetal complications after water birth in Ecuador using the only available data and compared the results with a public hospital in a one-year period.

2. Methodology

This observational retrospective analysis includes the entire set of maternal hospital discharges and the entire clinical records of 308 patients admitted to a local secondary level urban water birth center in Ecuador, as well as the total set of hospital discharges of 358 patients from Hospital Pablo Arturo Suarez, a local urban secondary hospital which does not offer water birth among its services.

The data was collected during 2013 and compares the maternal and fetal outcomes from the "land birth" group (traditional obstetrical table) and the "water birth group". The patients were matched for maternal and gestational age as well as for antenatal risk factors including previous C-Section or absolute and relative contraindications for vaginal birth.

Patient's information from Hospital Pablo Arturo Suarez came from the Latin American Center for Perinatology, Women's Health and Reproductive (CLAP/SMR) records, while data from the water birth was collected throughout a medical record retrieval.

Patient's demographics include age, socioeconomic status, and province of residency, type of establishment where delivery took place, education attainment, maternal and neonatal complications.

Data was analyzed and compared using descriptive statistics and risk ratio analysis, partially performed in Microsoft Excel™ and *episheet stat* open source statistical software. Risk Ratio comparisons were performed, using a 95% confidence interval calculation. References citation and retrieval were managed by Zotero Open Source Software version 4.0.11.

3. Results

3.1 Patient Demographic

The matched controlled data include 358 patients in the conventional land birth group and 308 for water birth group, difference in demographics also shown in Table 1.

Table 1. Maternal and Neonatal demographics from all the patients admitted to a private water birth centre in Quito, Ecuador and all the patients admitted to a secondary level public hospital in Quito, Ecuador in 2013. Parity analysis was not included since data was not complete in the public hospital

	Water Birth Center		Land Birth Center	
	N	*Mean/Percentage	N	*Mean/Percentage
New Born				
Weight	308	*3.18	350	*3.18
Height	308	*49.4	350	*49.4
Gestational Age	308	*39.2	350	*39.0
Female	152	49.3%	172	48.1%
Male	156	50.7%	186	51.9%
Mother				
Age	308	*28	358	*23
Contraceptive use	274	89%	72	20%
None	34	11%	286	80%
Education Level				
Basic school	0	0%	90	25%
High school	9	6.2%	214	59.7%
University	289	93.8%	54	15.3%

3.2 C-Section versus Vaginal Delivery

Women participating in this analysis were admitted to the hospital with a planned vaginal delivery, either in Water (308 women) or via conventional vaginal delivery (358 women). During the data collection period, just the women with planned vaginal delivery were included in the study and those mothers with absolute or relative indications for C-sections were excluded (Figure 1).

The data from both groups demonstrated that women giving birth conventionally (land birth) are 1.5 times less likely to have a C-section when compared to the group of mothers giving birth in water (OR 0.5 versus 1.98 $p < 0.05$).

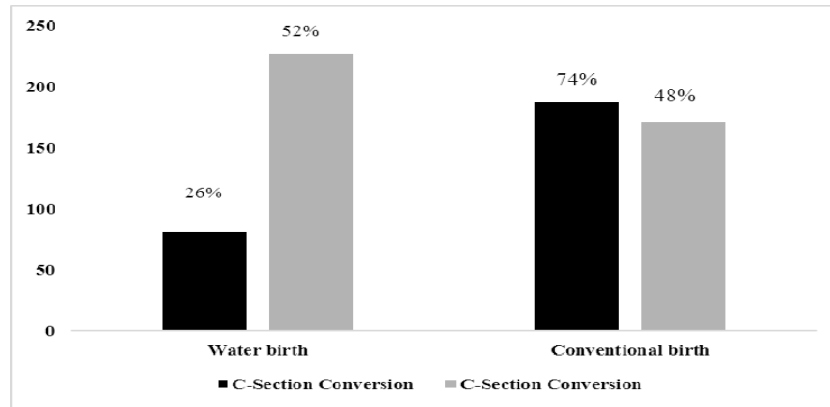


Figure 1. C-section conversion rate risk between water and conventional birth

Source: The black bars show the percentage of mothers who planned a vaginal birth but for any reason needed a C-section. Water birth women are less likely to undergo a surgical cesarean when compared to conventional birth (OR 0.5 versus 2 p<0.05).

3.3 Maternal Complications

We analyze the maternal or neonatal complications reported in the clinical records after giving birth in water and after conventional birth in both urban hospitals located in Quito, Ecuador.

In both groups, data was completed for the need of episiotomy, the presence of vaginal tears after expulsion, the use of oxytocin to improve uterine contractions, newborn resuscitation and fetal mortality (Figure 2).

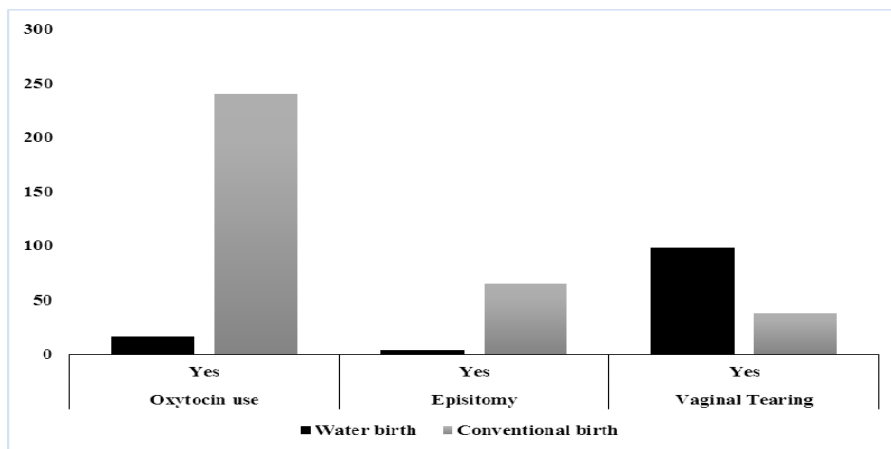


Figure 2. Maternal complications

Source: A comparison between water and conventional birth. The use of oxytocin (RR: 12.9 CI 7.9 to 20.9 p<0.0001) and intentional episiotomy (RR: 13.9 CI 5.1 to 37.9 p<0.0001) are much higher among conventional birth, however, the risk to have a vaginal tearing during water labor is 3 times higher than conventional birth (RR: 2.9 CI 2.12 to 4.2 p<0.0001)

When compared, water birth increase maternal risk of having a vaginal tear (RR: 2.9 CI 2.12 to 4.2 p<0.0001) when compared with land conventional birth. On the other hand, the use of administration of a prophylactic uterotonic Oxytocin (RR: 12.9 CI 7.9 to 20.9 p<0.000) and prophylactic episiotomy (RR: 13.9 CI 5.1 to 37.9 p<0.0001), are procedures more likely to occur among conventional births. In both cases of our study shows that just 1% of women require episiotomy (1%) while 18% underwent this procedure in the conventional scenario.

3.4 Newborn Complications

In 2013 in both centers, the risk of developing complications among children born in water versus those born

conventionally (land birth) was compared. The only complete data available was the one regarding newborn fatalities without implying causality, fetal size consistency and the use of oxygen reanimation for newborns (Table 2).

Table 2. Neonatal reported complications after water birth and land birth in Ecuador during 2013. Water birth data came from Clinica la Primavera and conventional land birth from Hospital Pablo Arturo Suarez

	Fatalities Reported				% Born Alive	Risk Ratio
	Alive	Dead				
Water birth	308	0	308	Total Water birth	100%	1.008450704
Conventional birth	355	3	358	Total Conv. birth	99%	0.991620112
	663	3	666	N		
	Total	Total				
	Reanimation				% Reanimation	Risk Ratio
	Yes	No				
Water birth	57	251	308	Total Water birth	19%	1.54077318
Conventional birth	43	315	358	Total Conv. birth	12%	0.649024797
	100	566	666	N		
	Total	Total				
	Fetal size consistency				% Size consistent	
	Yes	No				
Water birth	228	26	254	Total Water birth	90%	N/A
Conventional birth	328	30	358	Total Conv. birth	92%	N/A
	556	56	612	N		N/A
	Total	Total				
	Birth defects				% birth defects	
	Yes	No				
Water birth	0	308	308	Total Water birth	0%	N/A
Conventional birth	6	352	358	Total Conv. birth	2%	N/A
	6	660	666	N		
	Total	Total				

Fetal-size consistency in both groups is above 90%. This indicator reflects women in both groups had received good prenatal care and their newborns have decade weight/height for gestational age.

4. Discussion

The results obtained in two centers in Quito demonstrate that water birth had similar results when compared maternal or neonatal outcomes. Among 308 women who were scheduled to deliver their newborns in water, 73% successfully culminate in water vaginal births while 26% required a C-section. Among the conventional birth group, only 47% ended their pregnancy vaginally as planned and 53% required a C-section.

Although the entire set of data coming from the mothers included those who were candidate for vaginal delivery, the relationship between parity and outcome was not analyzed since the data was not completed for the control group. It is important to mention that mothers who already had vaginal births are more likely to deliver their following children naturally.

Although uterine contractions are not intentionally stimulated if not needed, the use of oxytocin was indicated in those mothers whom labor was delayed. For both groups, the use of oxytocin as well as the need to perform an intentional episiotomy is much higher among conventional birth; however, the risk to have a vaginal tearing during water labor is 3 times higher than conventional birth.

Water birth has become a more personal and intimate alternative for many women worldwide, who are looking to deliver their children vaginally (Nutter et al., 2014). An increasingly high interest for alternative and more respectful methods to deliver children worldwide has been reported in several countries (Wagner, 2001; Nutter et

al., 2014; Woodward & Kelly, 2004; Poder & Larivière, 2014).

Scientific reports have shown that giving birth in water reduced labor related pain, reduces maternal stress and might accelerates labor and early mother-baby attachment (Nutter et al., 2014).

Although some benefits over land conventional vaginal delivery are available, severe complications have also been published (Dahlen et al., 2013). The majority of these negative events that have been published as case reports, include: postpartum waterborne infections, hypothermia, aspiration, delayed thermoregulation, rupture of the umbilical cord, nearly drowning experiences, suffocation and even death (Pinette, Wax, & Wilson, 2004; Thoeni et al., 2005; Gilbert & Tookey, 1999; Nguyen et al., 2002; Nagai et al., 2003).

There is always the risk of having a nuchal cord or shoulder dystocia during the expulsion period; however, our results show that water does not increase the risk of any birth complication. In one year, three newborns died within the conventional delivery and none within the water birth group. It is important to point it out that congenital malformation among the public hospital group were higher; suggesting other factors such as the socioeconomic status and education attainment might be influencing the results.

Basic reanimation using only Oxygen and physical stimulation was more likely (1.54 vs 0.65) to be used in the water birth group, however, no further complications were reported afterwards.

The decision about how to give birth relies mostly on the physicians and depends in factors such as maternal education and access to alternative methods to give birth. In this sense, mothers from the private center are better educated. More than 90% of mothers from the private group attended a university, in comparison with the 15.3% of mothers from the control group. This factor plays an important role when deciding what type of medical services; the mothers are willing to receive including lactation practices (Ortiz-Prado et al., 2016).

The lack of publicly available information about water birth safety is an important determinant when deciding the most appropriate method to deliver their children in Ecuador. Although the number of patients who seek this type of procedure is unknown within the region and our country, it is estimated that at least 800 women deliver their children in water countrywide. Having locally collected data is an important tool for physicians and parents who are interested in these methods, especially when public health policies and guidelines are not available.

Our report is not intended to be used as a practical guide, but as one part of the framework around this method.

The limitations of our study includes the lack of more detailed and rigorous information elements about obstetrical care and the perinatal effects presented within the the first 24 hours pre and post-delivery, as well as lack of clinical management guidelines and legal considerations (public or private health insurance and patients rights) for those centers offering water births.

Although the level of evidence and the methodology used can be improved for further studies, the main point of this analysis was to describe the trends of maternal and neonatal complications among those patients who experienced water birth in the Ecuador.

The results of this investigation will be submitted to the Minister of Public Health in order to request a deeper analysis, a locally adaptable guideline for physicians who are willing to perform this type of procedure and a communicational campaign intended to inform parents about the benefits and possible risks linked to water birth.

5. Conclusions

We conclude that water birth is an effective method to deliver children as long as there is an adequate understanding of the risk and benefits of this procedure. Planning a water delivery seems to reduce the risk of using prophylactic uterotonic medication, prophylactic episiotomies and the need of unplanned C-sections. Due to higher incidence of vaginal tears, strict perianal protection during the third stage of labor is recommended.

Finally, we suggest that every center offering water birth need to have a well trained multidisciplinary team including neonatologists, obstetrician and midwives readably available in order to reduce the risk of maternal and neonatal complications.

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Competing Interests Statement

The authors declare that there is no conflict of interests regarding the publication of this paper.

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