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## Original Article

# A comparative study between the pioneer cohort of waterbirths and conventional vaginal deliveries in an obstetrician-led unit in Singapore



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## ABSTRACT

**Objective:** Waterbirth has been increasing in popularity in Asia (Lea W. Water babies. The Straits Times 17 February 2011. Available at [http://www.nuh.com.sg/news/media-articles\\_1504.html](http://www.nuh.com.sg/news/media-articles_1504.html)). National University Hospital, Singapore, is the pioneer hospital offering waterbirths to women since 2006 in a unique setting of a consultant-led service and continuous foetal monitoring. To date, no studies have been done on the conduct of waterbirths in an Asia. This study aims to evaluate if water immersion during delivery is associated with increased rates of adverse maternal and foetal outcomes as compared with conventional vaginal deliveries.

**Materials and Methods:** Clinical records of women who birthed underwater at National University Hospital between 2010 and 2013 were retrospectively reviewed. Outcomes of interest were estimated blood loss, third- or fourth-degree tears, incidence of postpartum infections or haemorrhage, neonatal Apgars at 1 and 5 min, and neonatal complications requiring intensive care unit admission. Outcomes were compared against a matched control group of women who had conventional vaginal deliveries within  $\leq 1$  month.

**Results:** Records of 118 women who birthed underwater were accrued. There was no significant difference in estimated blood loss and postpartum haemorrhage between groups, and there were no cases of maternal infection, third- or fourth-degree perineal tears, or adverse neonatal outcomes in either group. Women in the control group were more likely to have episiotomies (63.6% vs. 0.85%;  $p < 0.01$ ). Three cases of retained placenta were reported in the waterbirth group (0.03%).

**Conclusion:** Waterbirth at our centre does not appear to be associated with an increased incidence of adverse neonatal and maternal outcomes. The results of this study supported waterbirth as a birthing option to groups of low-risk women in an obstetrician-led setting with good midwifery support.

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## Introduction

The first mention of water immersion in labour was in France in 1805, where it was first used to increase maternal relaxation during labour. In the 1960s, Russian obstetricians Tjarkovsky and Leboyer further explored the concept, with a focus on improved neonatal outcomes. It was subsequently popularized by French obstetrician Michael Odent, who published the first research paper in 1983, where he described his experience with 100 waterbirths, which he

personally conducted. He proposed that immersion in the first stage of labour reduced the need for intervention and analgesia [1]. In support of a woman-centred decision making process, the Royal College of Obstetricians and Gynaecologists advocate water immersion as a birthing option that should be offered to healthy women with uncomplicated pregnancies [2]. However, waterbirth is fraught with controversy, as its safety is often questioned by anecdotal case reports of rare, but serious complications associated with waterbirth, such as neonatal drowning, transmission of waterborne infectious diseases, cord rupture, and neonatal (death [3]. A Cochrane review was performed by Cluett and Burns [4] that included 12 randomised control trials, eight of which looked at water immersion in the first stage of labour. Results of the review showed a decreased need for analgesia and duration of labour in

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the immersion group, and no evidence of increased adverse effects to the mother or baby [4]. These findings were corroborated by two other systematic reviews of the literature by Nutter et al [5] and Cordioli [6]. Both reviews showed evidence of benefits in the first stage of labour and no significant increase of adverse maternal or neonatal outcomes [5,6]. Both studies also noted the incidence of umbilical cord avulsion, with Nutter et al [5] quoting a calculated rate of 2.4 per 1000 waterbirths, which has yet to be shown as being significant. On the premise that the existing evidence has yet to demonstrate a clear benefit to mother and baby and the possibility of serious adverse events, the American College of Obstetricians and Gynaecologists (ACOG) released a joint committee opinion paper with the American Academy of Paediatrics in April 2014 stating that water immersion in the second stage of labour, “should be considered an experimental procedure that only should be performed within the context of an appropriately designed clinical trial with informed consent” [7].

More recently, the New England Journal of Medicine (NEJM) wrote a perspective on the National Institute for Health and Clinical Evidence-based review that women with low-risk pregnancies who give birth at home or in midwifery units are likely to have less unnecessary interventions performed on them than if they were to labour in an obstetrician-led unit [8]. In the NEJM review, the postulated reason for this difference was that “obstetricians, who are trained to use scalpels and are surrounded by operating rooms, are much more likely than midwives to pick up those scalpels and use them”, resulting in potential complications associated with these interventions [9]. Waterbirth has long been regarded as a natural method of delivery, with parturients often opting for minimal obstetric intervention in an effort to avoid the associated complications.

In the past decade, the acceptance of waterbirths as an alternative birthing method has extended to Singapore. The National University Hospital (NUH) began offering waterbirths in Singapore in 2006. An upward trend has since been observed in our numbers, and our centre is the largest tertiary hospital conducting waterbirths in Singapore. The ACOG statement release warrants evaluation of our practice. It is also worth looking into the differences in outcomes between a natural method of birthing with minimal interventions and the conventional vaginal delivery conducted at our centre, in light of the NEJM perspective on the high rate of interventions in obstetric units. At NUH, births are conducted in an obstetrician-led hospital setting, with strong midwifery support, continuous foetal heart monitoring, and readily available neonatal care in a bid to weave the merits of a natural birthing process into a system of care where unexpected complications can be dealt with expediently. Existing evidence is largely derived from studies on midwifery-led waterbirths in the West and focused on water immersion in the first stage of labour. Minimal data is available on the conduct of waterbirths in Asia. Chung et al [10] described the factors responsible in influencing the decisions of a group of nine women regarding waterbirths, and Nagai [11] published a case report of *Legionella pneumonia* following a home waterbirth that resulted in neonatal death. This would be the first study describing the unique arrangement of waterbirth in an obstetrician-led unit in an Asian population, specifically during the second stage of labour. The aim of our retrospective study was to compare maternal and neonatal outcomes among women who have had a successful delivery in water with a control group of women with normal vaginal deliveries.

## Materials and methods

### Data collection

Ethics approval was obtained from the Domain-specific Review Board (DSRB) under the National Healthcare Group, Singapore. This

study was considered under the exempt category, as non-identifiable datasets were used. All deliveries at NUH between January 2010 and December 2013 were reviewed, and women who had a delivery underwater during that time period were included in this study. Each case in the waterbirth group was matched for maternal age, parity (nulliparous or multiparous), and gestational age against controls selected as the next consecutive vaginal delivery within  $\leq 30$  days of the index case. Data was obtained from central hospital records, into which contemporaneous data was entered following each delivery. The following maternal demographics were collected: date of delivery, patient age, ethnicity, gestational age, parity, presence of antenatal conditions, such as gestational diabetes, Group B Streptococcal infections, and pregnancy-induced hypertension/pre-eclampsia. It was also noted if there was history of a previous caesarean section. Ethnicity was stated as “Others” if women belonged to ethnic groups outside the main ethnic groups found in Singapore (Chinese, Indian, Malay, Caucasian, or Eurasian). Primary outcomes of interest collected were estimated blood loss (EBL), third- or fourth-degree perineal tears, neonatal Apgar scores at 1 and 5 min, and neonatal complications requiring Neonatal Intensive Care Unit (NICU) admissions. Duration of labour was recorded as a secondary outcome of interest. EBL was recorded by the nursing staff following each delivery, according to the guidelines for visual estimation of blood loss proposed by Bose et al [12]. A validated method for visual estimation of blood loss in water was not available; however, this was not thought to affect the accuracy of blood-loss estimation significantly, as women were brought out of the tub immediately after delivering for management of the third stage of labour on land. Taking a mean EBL of 300 mL and an equivalence region of 500mL, it was determined that 130 subjects in each group would have 90% power to demonstrate no difference between both groups.

### Waterbirth protocol

Waterbirth is offered as an option at NUH to all women with the following exclusion criteria: (1) transmissible infections (human immunodeficiency virus, hepatitis, syphilis, herpes simplex, viral warts); (2) prematurity (<37 weeks); (3) severe intrauterine-growth restriction; and (4) conditions requiring close intrapartum monitoring, such as severe pre-eclampsia and diabetics requiring insulin infusions. Antenatally, these women attended regular follow-up with a specified obstetrician. According to the local waterbirth policy, the labouring woman was never left alone in the bath pool. On arrival to the delivery suite, all women, regardless of chosen planned-delivery method, were put on continuous cardiotocographic (CTG) monitoring. This is continued for 20 min to ensure foetal wellbeing before the waterbirth protocol was initiated. Women with clinical features suspicious of chorioamnionitis or foetal distress on initial assessment were not permitted to proceed with a waterbirth. Subsequent one-to-one intrapartum care was provided by a dedicated Enhanced Midwifery and Maternity Care midwife or doula according to a prewritten birth plan. Placed on a wireless CTG monitor, which is safe for use in water, women were then allowed to enter the birthing pool at their own comfort and convenience. Water temperature was maintained at between 35°C and 37°C, and the mother was immersed up to chest level. Maternal vital signs were checked every 30 min. Water cleanliness was maintained throughout labour by removal of faecal material and debris using a sieve, with changes of water, if necessary. Vaginal examinations were conducted either in the water using a long, sterile glove or on the bed. In the event of foetal or maternal compromise, women were immediately removed from the water and attended to as per the routine-delivery suite safety protocol. The consultant was updated regularly throughout labour

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