Waterbirths – stay on the safe side

Abstract
In this article the outcomes for neonates following waterbirths and traditional births are discussed. The umbilical cord blood pH and Apgar scores of neonates born under water are equal to or higher than the umbilical cord blood pH and Apgar scores of neonates born out of water. Some adverse outcomes in neonates following a waterbirth are reported, namely neonatal infections, neonatal hyponatraemia, water aspiration, and foetal hyperthermia, which probably cause hypoxic ischaemic encephalopathy and snapped umbilical cords. Guidelines on how to prevent possible adverse outcomes in neonates during waterbirths are given. When these guidelines are followed, none of the above mentioned adverse outcomes are seen. The outcomes for neonates following waterbirths versus traditional births are then similar.

Introduction
Waterbirths are getting more popular worldwide. There is an increase in the number of babies that are delivered in a birth tub filled with warm water. According to the mothers it is a wonderful experience! Immersion in water during labour and delivery reduces the labour pains significantly. Neonates also appear to do well after waterbirths.1–3

However, there are some reports that describe adverse outcomes in neonates following waterbirths. Are these adverse outcomes related to the waterbirths? This is not always easy to determine. The midwife must take every possible precautionary measure to ensure that a waterbirth is a safe method of delivery for the neonate.

Little research has been conducted about waterbirths. A few theories about waterbirth exist, but these theories are not yet proven and explored. More research on this topic is necessary to clarify some aspects.

In this article a few adverse outcomes in neonates after waterbirths are described and compared with neonates born out of the water. Guidance on how to prevent each of these possible adverse outcomes is given.

Neonatal infections
Neonatal infections after birth are not uncommon. It appears as if the number of infections found in neonates born under water and out of water is the same. This was seen in two observational studies conducted in Switzerland, a retrospective comparative study conducted in the United Kingdom, and a retrospective case-control study conducted in Austria. These studies compared waterbirths with traditional bedbirths.4–7

When infections in neonates are found following waterbirths, the debate is whether the waterbirths contributed to the prevalence of these infections. The following infections in neonates after waterbirths have been reported: Group B Streptococcal meningitis, Pseudomonas infections, Legionella infections and a rare Escherichia coli infection.8–12 In an explorative descriptive survey done in South
Africa, one neonate out of 27 delivered under water was admitted to the neonatal intensive care unit with a diagnosis of sepsis and congenital pneumonia. No organism could be isolated. Did these infections come from the water, the birth tub, the mother, or from somewhere else?

In some instances, *Klebsiella, Pseudomonas* and *Legionella* have been found in the birthing tub, filling hose, taps, exit hose and disposable lining of the birth tub. When these organisms are found in the birthing tub system, one can possibly infer that the neonate acquired the infection from the birthing tub system.

There are other causes for neonatal infections other than the birthing tub system, namely an infected mother who contaminates her baby during pregnancy, labour or delivery or through her breast milk when she breastfeeds her baby. The neonates may also acquire infections from the nursery, from other neonates, from the nursery staff or from the environment.

Therefore, it is of the utmost importance that the midwife ensures that the birthing tub system is thoroughly cleaned to prevent the growth of pathogenic organisms. The birth tub must be cleaned with Biocide D® or any other appropriate disinfectant before and after growth of pathogenic organisms. The birth tub must be cleaned with Biocide D® or any other appropriate disinfectant before and after every delivery and with Hibiscrub® just before the woman gets into the birth tub. The bath should be kept dry when not in use. The hoses used to fill the birth tub must not be the same as those used to empty the birth tub after it has been contaminated with the bodily fluids of the mother and the neonate. Regular bacterial swabs should be taken from the inlet taps, the side and bottom of the tub and the drains, and sent for analysis.

The question arises whether waterbirths reduce the risk for transmission of infections from mother to child. A prospective trial that was conducted in Switzerland showed that fewer neonates are colonised with Group B streptococcal infections following waterbirths than after bedbirths. It appears that the water may disseminate the organisms and in this way decrease the risk for mother-to-child transmission during delivery.

**Neonatal hyponatraemia**

When a neonate swallows a few mouthfuls of water directly after birth, while being under water in the birth tub, the neonate may develop water intoxication, or in other words, hyponatraemia. This happens as follows: when the water in the birth tub enters the neonate’s mouth and flows to the back of the throat, it passes the tongue. There are numerous chemoreceptors or taste buds on the tongue and these chemoreceptors recognise that water is flowing down the throat. The glottis automatically closes and the solution is then swallowed, not inhaled. This autonomic reflex is present until about the age of six to eight months when it disappears. This is called the dive reflex. Any fluid, including breastmilk, that flows down the oropharynx and passes the chemoreceptors will cause the glottis to close and the neonate will then swallow the fluid.

It is known that there are a few neonates who developed hyponatraemia after waterbirths. These neonates subsequently suffered convulsions. It is assumed that there is an association between hyponatraemia and convulsions. Probably hyponatraemia causes convulsions. The normal serum sodium level is 133–146 mmol/L for a full term neonate. Hyponatraemia occurs when the neonate’s serum sodium level is less than 133 mmol/L.

Hyponatraemia in the neonate should be prevented. When adding salt to the water in the birthing pool, the water becomes isotonic, which most probably will prevent dilution and hyponatraemia. One kilogram of coarse salt must be added to every 100 L of water. Should more water need to be added to the birth tub at a later stage, coarse salt must be added in relation to the amount of water that was added, namely 10 g of coarse salt per one litre of water.

When coarse salt is added to the water in the birth tub as described above, no differences are seen in the umbilical cord blood sodium levels of the neonates born under water and those born traditionally on a bed.

**Figure 2**: Coarse salt should be added to the water in the birth tub to prevent hyponatraemia in neonates born under water in a birth tub

**Foetal distress**

Foetal distress and severe intrapartum hypoxia may cause the newborn baby to be severely compromised and literally at his/her “last gasp”. This condition overrides the mechanism of the dive reflex and causes the neonate to gasp for air. When the neonate is then delivered under water, the neonate will inhale water and develop water aspiration. Therefore, the woman in labour should leave the birth tub immediately in the event of foetal distress.

**Foetal hyperthermia**

When the thermometer is held under the neonate’s axilla with the neonate’s upper arm pressed against the thorax, the normal range of axillary temperature of the neonate is between 36.5˚C and 37˚C. The temperature of the foetus is always 1˚C greater than that of the mother.

When a woman in labour is exposed to very warm water in a birth tub for a prolonged period of time, the water causes hyperthermia in the woman. Her heat may then be transferred to the foetus and cause foetal hyperthermia. The foetus has difficulty with heat elimination and cooling...
Incidents have been reported where neonates developed hypoxic ischaemic encephalopathy after waterbirths where the mothers were exposed to very warm water in the birth tub for prolonged periods of time.13,22

Although the average water temperature in the birth tub during an explorative descriptive survey in South Africa was 38.3°C, no differences were seen in neonatal temperature between neonates born under water and neonates born traditionally on a bed and no cases of hypoxic ischaemic encephalopathy were seen. The mothers were in the bath tub during labour until the birth of their neonates for an average of one hour and eight minutes, the shortest duration being five minutes and the longest two hours and 54 minutes. Overall this relatively short duration of the mothers’ immersion in the birth tub probably prevented much heat transfer from the water to the mother, and then to the foetus.13

It is advised that midwives should use medical industrially manufactured thermometers and not commercially manufactured thermometers to ensure that accurate readings of water temperatures are taken. The commercially manufactured thermometers measure a temperature of 1–2°C less than the medical industrially manufactured thermometers. These commercially manufactured thermometers cannot give an exact temperature reading, unlike the medical industrially manufactured thermometers, which give a very accurate temperature reading. When a patient asks for warmer water, the midwives should explain why the temperature of the water should not be more than 37°C.14

Figure 3: The medical industrially manufactured thermometer (left) should be used to measure the temperature of the water in the birth tub and not the commercially manufactured thermometer (right).

Cooling of the neonate’s skin causes sensory stimulation, which can result in the initiation of breathing within seconds after birth. That is why the temperature of the water in the birth tub during the second stage of labour must preferably be 36°–37°C. When the water temperature is not too cold, the neonate will have the urge to take a breath only after he/she has been removed from the water. Until that time, the neonate receives his/her oxygen from the mother via the placenta and umbilical cord.23,24

Apgar score

When an Apgar score is determined, five physical signs of neonates are evaluated at one, five and ten minutes after birth. These five physical signs are heart rate, respiratory effort, muscle tone, response to stimulation and colour. Each sign scores 0, 1 or 2 points. A score out of 10 is calculated by adding up points given to each sign. The higher the score, the better the neonate’s condition at birth.14

Two prospective observational studies conducted in Switzerland, an explorative descriptive survey conducted in South Africa and a collaborative waterbirth audit done in the United Kingdom found that Apgar scores after waterbirths are significantly higher than Apgar scores after traditional bedbirths.14,18,23 A case controlled retrospective study conducted in the United Kingdom and a randomised controlled trial conducted in South Africa, on the other hand, found no statistically significant difference in Apgar scores between neonates delivered under water and out of water.20,27

The Apgar score does not assess the neurological status of the infant or the immediate effects of preceding foetal hypoxaemia. A baby may suffer severe hypoxia in utero as reflected by a low cord blood pH level and yet have a high Apgar score at birth. An infant, who is sedated and have a low Apgar score, may have a normal cord blood pH level. Thus, umbilical cord blood pH levels should be determined to have an accurate reflection of the neonate’s condition at birth.14

Umbilical cord blood pH level

The blood pH of the neonate reflects the acid–base balance of his/her blood. Blood pH is maintained within narrow limits to permit optimum metabolism. The normal pH value for a term neonate on his/her first day of life ranges between 7.27 and 7.47. A pH of less than 7.27 is called acidemia and a pH of more than 7.47 is termed alkalaemia. Apnoea, respiratory distress, hypoxaemia and birth asphyxia cause the pH to decrease and hyperventilation causes the pH to rise. The higher the pH level, the better the condition of the neonate, provided that the pH is not more than 7.47.14,19

A prospective observational study conducted in Switzerland and a retrospective case-control study conducted in Austria found that the cord blood pH of babies delivered under water tends to be higher than that of babies not delivered under water. Therefore, it seems that the condition of the neonate delivered under water is better than the condition of the neonate delivered out of water.2,7 On the other hand, a randomised controlled trial and an explorative descriptive survey, both conducted in South Africa, and another prospective observational study conducted in Switzerland found no difference in cord blood pH levels between neonates delivered under water and out of water.4,13,27
Snapped umbilical cords
Cases of umbilical cord rupture have been reported after waterbirths. Some of these neonates required a blood transfusion. Umbilical cord rupture may be due to rapid cord traction when the neonates are brought to the surface too quickly. To minimise the risk for snapped umbilical cords, the traction on the umbilical cord should be reduced and kept to a minimum by lowering the water level as the infant is born and by taking the infant to the surface of the water slowly and gently. It is important to check continuously for signs of umbilical cord rupture and to clamp the umbilical cord as soon as possible when signs of rupture are observed.22,28-31

Conclusion
No significant differences in the outcomes for neonates between those born under water and those born out of water are seen when the birth tub is always thoroughly cleaned, when coarse salt is added to the water in the birth tub, when the temperature of the water in the birth tub never exceeds 37°C and is kept at 36°C–37°C during the second stage of labour, when the neonate is taken to the surface of the water slowly and gently and when it is ensured that a foetus with foetal distress will not be delivered under water. Therefore, a waterbirth is a valuable alternative to a traditional delivery.

Table I: Guidelines on preventing adverse outcomes in neonates during waterbirths

<table>
<thead>
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<tr>
<td>Measure the water temperature with a medical industrially manufactured thermometer</td>
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<td>The woman must leave the birth tub when there is foetal distress</td>
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<tr>
<td>Bring the neonate slowly and gently to the surface of the water after delivery</td>
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<td>Keep the room temperature of the delivery suite at or above 23°C</td>
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<td>Keep the room free from draughts</td>
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<td>Keep the neonates warm with warm towels and skin-to-skin contact with the mothers</td>
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<td>Dry neonates thoroughly when taken out of the water</td>
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<td>Take regular bacterial swabs from the inlet taps, the drains and the sides and bottom of the birth tub</td>
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References
26. Rodrigs MN, Brown L, Williams C, Carmalt RS. Delivery under water: safety and how different it is from conventional births. Unknown Journal n.d.; P2.00.04