# EFECTOS DE LA HIDROTERAPIA DURANTE EL TRABAJO DE PARTO EN TÉRMINOS DE SALUD MATERNA Y NEONATAL

UNIVERSIDAD DE GRANADA

**TESIS DOCTORAL**

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# Efectos de la hidroterapia durante el trabajo de parto en términos de salud materna y neonatal.

Memoria presentada por Elena Mellado García para optar al título de Doctora.

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# Contenido

# RESUMEN

La hidroterapia, específicamente enfocada en mujeres embarazadas durante el parto, ha demostrado ser una opción cómoda y útil para muchas mujeres. La experiencia de un parto en el agua es deseada por muchas familias, ya que permite un nacimiento natural y fisiológico, y puede empoderar a las mujeres mejorando sus habilidades durante el parto. Según la evidencia científica, en términos de satisfacción materna, muchas mujeres reportaron una experiencia más positiva y una mayor sensación de control sobre el proceso de parto cuando utilizaron hidroterapia, lo que podía contribuir a mejores resultados psicológicos postparto.

Este método tiene varias características clave que lo hacen una opción atractiva. La hidroterapia se utiliza principalmente durante la primera etapa del parto, cuando las contracciones son más intensas y la dilatación cervical está en progreso. La temperatura del agua generalmente se mantiene aproximadamente en 37.4ºC, una temperatura cómoda para la madre y segura para el neonato. El agua ayuda a reducir el dolor y el estrés, y puede acelerar el proceso de dilatación. El agua caliente relaja los músculos, disminuye la percepción del dolor y reduce la necesidad de analgesia epidural. Además, la flotabilidad del agua permite a las mujeres moverse más libremente y adoptar posiciones más cómodas durante el trabajo de parto, lo que puede aliviar la presión en ciertas áreas del cuerpo. Asimismo, la reducción de la gravedad y la presión abdominal, que facilita la rotación y el descenso del feto, representan ventajas adicionales de la hidroterapia.

Los objetivos planteados en la presente tesis doctoral fueron evaluar e investigar el impacto del uso de la hidroterapia durante el parto en diversos aspectos maternos y neonatales. Además, se describieron y analizaron los tipos de parto en las gestantes que utilizaron hidroterapia, comparándolos con los de aquellas que no la usaron, y examinando factores demográficos, obstétricos y de salud para entender las diferencias y similitudes.

También se identificaron las diferencias en indicadores del parto, como la percepción del dolor, la forma de terminación del parto y los tiempos de cada etapa.

Se evaluó la influencia de la hidroterapia en parámetros neonatales, como el puntaje Apgar, el ingreso en la unidad de cuidados intensivos neonatales y otras complicaciones fetales, para determinar cómo afectaba la hidroterapia al recién nacido. Se observó que este método no representó riesgos significativos para el recién nacido. Finalmente, se comprobó cómo la hidroterapia influyó en los resultados maternos, incluyendo el estado perineal, la hemorragia posparto y otras complicaciones, demostrando que el uso de hidroterapia durante el trabajo de parto puede ser una opción segura y efectiva.

Estos objetivos ofrecieron una visión integral de los beneficios y posibles riesgos del uso de la hidroterapia durante el parto, contribuyendo a una mejor comprensión y potencial implementación de esta práctica en el ámbito obstétrico.

Se trata de un estudio cohorte retrospectivo, analizamos los datos de mujeres que dieron a luz en el Hospital Costa del Sol entre 2010 y 2020, revisando registros médicos y datos clínicos existentes. El objetivo principal fue comparar las duraciones de la primera etapa del trabajo de parto entre el grupo que utilizó hidroterapia y el grupo que no la utilizó. Basado en estudios previos y referencias, se determinó que una diferencia de tiempo de menos de 16 minutos era estadísticamente significativa. Con una desviación estándar de 48 minutos,un error alfa de 0.05 y un error beta de 0.20, se calculó que se necesitaban 111 pacientes por grupo. Para compensar una pérdida estimada del 10% en la evaluación de registros médicos, el tamaño total de muestra se ajustó a 248 pacientes (124 por grupo). Para asegurar que el grupo de hidroterapia tuviera 124 participantes, se expandió la muestra total a 377 mujeres, resultando en 253 mujeres en el grupo de control y 124 en el grupo de hidroterapia.

El estudio demostró que la hidroterapia durante el parto es segura, sin diferencias significativas en la hipotensión materna, hemorragia posparto, fiebre posparto o infecciones.

Además, se observó un aumento significativo en la tasa de lactancia materna entre las madres que optaron por la hidroterapia.

No hubo diferencias significativas en el tipo de parto, aunque el grupo de hidroterapia tuvo una menor incidencia de partos distócicos, lo que coincide con estudios previos que reportaron una disminución en las tasas de cesáreas y un aumento en los partos espontáneos en grupos que utilizaron hidroterapia.

La hidroterapia también se asoció con una menor percepción del dolor durante el parto y una menor demanda de analgesia epidural. Las mujeres que no utilizaron hidroterapia tuvieron una mayor demanda de analgesia epidural. Varios estudios respaldan estos hallazgos al explicar cómo la hidroterapia reduce las hormonas del estrés, facilitando las interacciones neurohormonales que disminuyen la percepción del dolor durante el parto. Nuestro estudio sugiere que la experiencia de dolor de las madres podría mejorarse significativamente con el uso de hidroterapia.

En cuanto a la duración de las etapas del parto, no hubo diferencias significativas entre la 1ª y 2ª etapa del parto entre las mujeres que hicieron uso de la hidroterapia y las que no, sin embargo la 3º etapa del parto fue más corta en aquellas mujeres que no usaron la hidroterapia, hecho que puede ser debido al uso extensivo del alumbramiento farmacológico que se realiza habitualmente durante la atención al parto. Nuestros hallazgos contrastan con los presentados en otros estudios publicados, quienes no encontraron diferencias significativas en la duración total del parto o en la duración de la primera etapa del parto entre las mujeres que utilizaron hidroterapia y las que no.

En relación con la salud materna, nuestros hallazgos, respaldados por otros estudios, no mostraron efectos adversos como infecciones o hemorragias significativas. Encontramos estudios que no observaron efectos infecciosos ni encontraron diferencias en términos de hemorragia posparto, infección materna y desgarros perineales. Según dos metanálisis, la hidroterapia durante el parto está asociada con un menor riesgo de hemorragia posparto. Sin embargo, en nuestro estudio, observamos una mayor incidencia de hemorragia posparto en el grupo que utilizó hidroterapia. El uso de hidroterapia no se relacionó con un mayor riesgo de desgarros perineales y se observó un menor número de episiotomías posiblemente debido al manejo activo de la tercera etapa del parto fuera del agua.

Los resultados neonatales fueron favorables, con datos y evidencia actual que muestran que la hidroterapia no se asocia con una mayor incidencia de resultados neonatales adversos. No encontramos diferencias significativas en las puntuaciones de Apgar entre los recién nacidos de ambos grupos, lo que concuerda con estudios previos que tampoco encontraron diferencias significativas en las tasas de infección neonatal, pH arterial y venoso,o admisiones a la unidad de cuidados intensivos neonatales.

Decidimos estudiar si existían diferencias significativas entre aquellas mujeres que, optando por la hidroterapia, utilizaban bañera o la ducha. Los resultados proporcionaron evidencia de que tanto la ducha terapéutica como la bañera son efectivas para el alivio del dolor durante el trabajo de parto y no representan riesgos significativos para la madre o el neonato. No obstante, nuestros resultados muestran que la ducha terapéutica podría ser preferible en términos de una menor duración del trabajo de parto y una menor incidencia de desgarros y episiotomías, mientras que la bañera podría ser preferible en cuanto a la disminución de la percepción del dolor.

En general, se ha observado que la inmersión en agua durante el parto no está asociada con diferencias significativas en los resultados maternos y neonatales en comparación con los

métodos convencionales, y además ofrece beneficios como la reducción en el uso de analgesia epidural.

Los resultados sugieren que la hidroterapia durante el parto es una opción segura y efectiva, con beneficios potenciales tanto para la madre como para el recién nacido. No presenta un mayor riesgo que el parto sin hidroterapia en términos de complicaciones maternas y neonatales, respaldando así la seguridad de la hidroterapia como una opción viable para las mujeres que desean utilizarla durante el parto.

# ABSTRACT

Hydrotherapy, specifically focused on pregnant women during labor, has proven to bea comfortable and useful option for many women. The experience of water birth is desired by many families, as it allows for a natural and physiological birth and can empower women by enhancing their skills during labor. According to scientific evidence, in terms of maternal satisfaction, many women reported a more positive experience and a greater sense of control over the labor process when using hydrotherapy, which could contribute to better postpartum psychological outcomes.

This method has several key features that make it an attractive option. Hydrotherapyis primarily used during the first stage of labor when contractions are more intense and cervical dilation is in progress. The water temperature is generally maintained at approximately 37.4°C, which is comfortable for the mother and safe for the neonate. The water helps reduce pain and stress and can accelerate the dilation process. Warm water relaxes the muscles, decreases pain perception, and reduces the need for epidural analgesia. Additionally, the buoyancy of the water allows women to move more freely and adopt more comfortable positions during labor, which can alleviate pressure in certain areas of the body. Moreover, the reduction in gravity and abdominal pressure, which facilitates fetal rotation and descent, are additional advantages of hydrotherapy.

The objectives outlined in this doctoral thesis were to evaluate and investigate the impact of using hydrotherapy during labor on various maternal and neonatal aspects. Furthermore, the types of labor in pregnant women who used hydrotherapy were described and analyzed, comparing them with those who did not use it and examining demographic, obstetric, and health factors to understand the differences and similarities. Differences in labor indicators such as pain perception, mode of delivery, and the duration of each stagewere also identified.

The influence of hydrotherapy on neonatal parameters such as Apgar scores, admission to the neonatal intensive care unit, and other fetal complications was evaluated to determine how hydrotherapy affected the newborn. It was observed that this method did not pose significant risks to the newborn. Finally, the impact of hydrotherapy on maternal outcomes, including perineal status, postpartum hemorrhage, and other complications, was assessed, demonstrating that the use of hydrotherapy during labor can be a safe and effectiveoption.

These objectives provided a comprehensive view of the benefits and potential risks of using hydrotherapy during labor, contributing to a better understanding and potential implementation of this practice in the obstetric field.

This retrospective cohort study analyzed data from women who gave birth at the Hospital Costa del Sol between 2010 and 2020, reviewing medical records. The primary objective was to compare the durations of the first stage of labor between the group thatused hydrotherapy and the group that did not. Based on previous studies and references, it was determined that a time difference of less than 16 minutes was statistically significant. With a standard deviation of 48 minutes, an alpha error of 0.05, and a beta error of 0.20, it was calculated that 111 patients per group were needed. To compensate for an estimated 10% loss in medical record evaluation, the total sample size was adjusted to 248 patients (124 per group). To ensure that the hydrotherapy group had 124 participants, the total sample was expanded to 377 women, resulting in 253 women in the control group and 124in the hydrotherapy group.

The study demonstrated that hydrotherapy during labor is safe, with no significant differences in maternal hypotension, postpartum hemorrhage, postpartum fever, or infections. Additionally, there was a significant increase in breastfeeding rates among mothers who opted for hydrotherapy.

There were no significant differences in the type of delivery, although the hydrotherapygroup had a lower incidence of dystocic deliveries, consistent with previous studies reportinga decrease in cesarean rates and an increase in spontaneous deliveries in groups that used hydrotherapy.

Hydrotherapy was also associated with a lower perception of pain during labor and a reduced demand for epidural analgesia. Women who did not use hydrotherapy had a higher demand for epidural analgesia. Several studies support these findings by explaining how hydrotherapy reduces stress hormones, facilitating neurohormonal interactions that decrease pain perception during labor. Our study suggests that the pain experience of mothers couldbe significantly improved with the use of hydrotherapy.

Regarding the duration of labor stages, the first stage was shorter in the hydrotherapy group, while the third stage was shorter in the control group. These findings may be related to differences in group composition, especially in parity. Our findings contrast with other published studies that did not find significant differences in the total duration of labor or the duration of the first stage of labor between women who used hydrotherapy and those whodid not.

In relation to maternal health, our findings, supported by other studies, did not show adverse effects such as significant infections or hemorrhages. We found studies that did not observe infectious effects or differences in terms of postpartum hemorrhage, maternal infection, and perineal tears. According to two meta-analyses, hydrotherapy during labor is associated with a lower risk of postpartum hemorrhage. However, in our study, we observeda higher incidence of postpartum hemorrhage in the hydrotherapy group. The use of hydrotherapy was not associated with an increased risk of perineal tears, and a lower number of episiotomies was observed, possibly due to active management of the third stage of labor outside the water.

Neonatal outcomes were favorable, with current data and evidence showing that hydrotherapy is not associated with a higher incidence of adverse neonatal outcomes. We found no significant differences in Apgar scores between newborns in both groups, which is consistent with previous studies that also found no significant differences in neonatal infection rates, arterial and venous pH, or admissions to the neonatal intensive care unit.

We decided to study whether there were significant differences between women who opted for hydrotherapy using a tub or a shower. The results provided evidence that both the therapeutic shower and the tub are effective for pain relief during labor and do not pose significant risks to the mother or neonate. However, our results show that the therapeutic shower might be preferable in terms of shorter labor duration and lower incidence of tears and episiotomies, while the tub might be preferable in terms of reduced pain perception.

Overall, immersion in water during labor has not been associated with significant differences in maternal and neonatal outcomes compared to conventional methods and offers benefits such as a reduction in epidural analgesia use.

The results suggest that hydrotherapy during labor is a safe and effective option, with potential benefits for both the mother and the newborn. It does not present a higher risk than labor without hydrotherapy in terms of maternal and neonatal complications, thus supporting the safety of hydrotherapy as a viable option for women who wish to use it during labor.

# MARCO TEÓRICO

# *El parto*

El parto es el proceso natural que marca el final del embarazo, donde el feto y anejos son expulsados del útero, ya sea con vida o no, hacia el exterior del cuerpo de la mujer. Para considerarse parto, la gestación debe tener más de 22 semanas o el feto debe pesar más de 500 gramos (1). Cualquier situación por debajo de estos criterios se consideraría un aborto.

El concepto de "parto normal" puede variar según diferentes organizaciones e investigaciones. En 2007, la Federación de Asociaciones de Matronas de España (FAME) estableció una definición para el "parto normal": *"Proceso fisiológico único con el que la mujer finaliza su gestación a término, en el que están implicados factores psicológicos y socioculturales. Su inicio es espontáneo, se desarrolla y termina sin complicaciones, culmina con el nacimiento y no implica más intervención que el apoyo integral y respetuoso del mismo"* (2). Según esta definición, el "parto normal" se caracteriza por:

- Ser un proceso fisiológico: Se refiere a un parto en el que no se presentan complicaciones o intervenciones médicas innecesarias. Es un proceso natural en el que el cuerpo de la mujer sigue su curso sin necesidad de intervenciones médicas significativas.

- Ser respetuoso con la mujer y su autonomía: Se prioriza el respeto a las decisiones y preferencias de la mujer durante el parto. Se busca brindar información adecuada y apoyo emocional para que la mujer pueda tomar decisiones informadas sobre su proceso de parto.

- Ser seguro y de calidad: Aunque se considera un proceso natural, se enfatiza la importancia de contar con un entorno seguro y de calidad para el parto. Esto implica tener acceso a una atención médica adecuada y a profesionales capacitados que puedan brindar atención y apoyo en caso de que surjan complicaciones.

La Sociedad Española de Ginecología y Obstetricia (SEGO) lo definió como: "Trabajo de parto de una gestante sin factores de riesgo durante la gestación, que se inicia de forma espontánea entre la 37ª-42ª semana y que, tras una evolución fisiológica de la dilatación y el parto, termina con el nacimiento de un recién nacido normal que se adapta de forma adecuada a la vida extrauterina. El alumbramiento y el puerperio inmediato deben, igualmente, evolucionar de forma fisiológica" (3).

La Organización Mundial de la Salud (OMS) definen el parto como: *"Comienzo espontáneo, bajo riesgo al comienzo del parto manteniéndose como tal hasta el alumbramiento. El niño nace espontáneamente en posición cefálica entre las semanas 37 a 42 completas. Después de dar a luz, tanto la madre como el niño se encuentran en buenas condiciones* " (4).

Es importante tener en cuenta que la definición de "parto normal" puede variar entre diferentes países, culturas y prácticas médicas. Además, cada mujer puede tener una experiencia única durante el parto, por lo que es fundamental brindar un enfoque individualizado y centrado en la mujer durante todo el proceso.

## Clasificaciones del parto

Existen diferentes clasificaciones del parto, que son las siguientes:

Según la edad gestacional:

- Pretérmino: cuando el parto ocurre antes de las 37 semanas de gestación.
- A término: cuando el parto ocurre entre las semanas 37 y 42.
- Postérmino: cuando el parto ocurre a partir de la semana 42.

Según el inicio:

- Espontáneo: cuando el parto se desencadena de forma natural, sin intervención externa.
- Inducido: cuando se utilizan métodos mecánicos o farmacológicos para iniciar el parto.

Según la presentación:

- Cefálica: cuando la cabeza fetal es la primera en presentarse.
- Podálica: cuando el feto presenta las nalgas y/o los pies.

Según la vía de finalización:

- Vaginal: cuando el feto nace a través del canal vaginal, ya sea de forma espontánea o con la ayuda de instrumentos como ventosas, fórceps o espátulas.
- Cesárea: cuando el feto nace mediante una intervención quirúrgica abdominal.

Según el número de fetos:

- Simple: cuando solo hay un feto.
- Múltiple: cuando se produce el nacimiento de varios fetos.

Según la duración (5):

La duración de la fase activa del parto es variable entre las mujeres y depende de la paridad. Su progreso no es necesariamente lineal.

En primíparas:

- El promedio de duración es de 8 horas.
- Es improbable que dure más de 18 horas.

En multíparas:

- El promedio de duración es de 5 horas.
- Es improbable que dure más de 12 horas.

La matrona es la profesional encargada de supervisar y atender partos de bajo riesgo, así como de dirigir el parto fisiológico y brindar asistencia al recién nacido. Además, su función incluye la detección de cualquier anomalía para alertar al equipo médico, si es necesario (6).

## Pródromos: La Fase Previa al Parto.

La fase de pródromos es la etapa previa al trabajo de parto. En este momento, se producen cambios en el cuello del útero y una serie de síntomas físicos y psíquicos. El diagnóstico diferencial del verdadero trabajo de parto, con lo que se denomina "pródromo" o falso trabajo de parto cumple lo siguiente (7):

- Contracciones uterinas a intervalos irregulares
- Los intervalos permanecen largos
- La intensidad no cambia
- Malestar principalmente en abdomen inferior
- Cuello uterino no se dilata
- El malestar se alivia con la sedación

Estas contracciones prodrómicas ayudan a distender el segmento inferior del útero y a descender la presentación fetal. También contribuyen a la maduración del cuello del útero, que se reblandece y se centra para favorecer la formación del canal del parto.

La rotura espontánea de la bolsa amniótica puede producirse en cualquier momento, antes del proceso de parto, durante e incluso después de que el neonato haya nacido. No se recomienda romper la bolsa amniótica de manera rutinaria (amniotomía artificial). Si se produce de manera espontánea (amniorrexis espontanea), se debe valorar el color del líquido amniótico, que debe ser transparentes o ligeramente manchadas de sangre, lo que no es patológico. El líquido amniótico teñido de verde o amarillo puede indicar riesgo de estrés fetal, aunque en la mayoría de los casos no tiene un significado patológico. En tales situaciones, se debe realizar una estrecha vigilancia fetal a través del registro cardiotocográfico fetal.

El inicio del parto se considera cuando la mujer experimenta contracciones regulares que resultan en el borrado y dilatación del cuello del útero. El borrado implica el acortamiento del cuello del útero, unificando el orificio cervical interno y externo, mientras que la dilatación es la apertura de los orificios cervicales para formar el canal del parto y permitir el paso del feto.

## Etapas del parto

El proceso de parto es continuo, para facilitar su estudio y manejo clínico fue Friedman quien en 1954 analizó el proceso de parto, desarrolló el análisis grafico del trabajo de parto definiéndolo como partograma, estableció unas divisiones funcionales del trabajo de parto y los límites fisiológicos para cada una de ellas. Friedman diferenciaba entre una fase de latencia y una fase activa. Dentro de la fase activa señaló; la fase de aceleración (hasta los 4 cm), la fase de velocidad de dilatación máxima (de 4 a 9 cm) y la fase de desaceleración (de 9 cm a 10 cm que supone la dilatación completa), finalmente el expulsivo.

Según Friedman la fase latente en mujer nulípara puede durar hasta 20 h y en multíparas hasta 14 h. Estableció el ritmo de dilatación en 1.2 cm/h en mujeres nulíparas y 1.5 cm/h en multíparas (8).

### La Fase de dilatación (primera etapa del parto)

El periodo de dilatación consta de dos fases:

**La Fase Latente**

Es una evolución más lenta de la dilatación, comienza con contracciones de parto y finaliza con unos centímetros de dilatación y borramiento del cuello. Dependiendo del organismo puede variar la descripción:

- La Guía de Práctica Clínica sobre la atención al parto normal (GPC) establece que comienza con el inicio del parto y se caracteriza por la presencia de contracciones variables

en cuanto a intensidad y duración, y se acompaña de borramiento cervical y progresión lenta de la dilatación hasta los 2 a 4 cm (5).

- La OMS considera que la fase latente del período de dilatación se caracteriza por contracciones uterinas dolorosas y cambios variables del cuello uterino, incluso con un cierto grado de borramiento y progresión más lenta de la dilatación hasta 5 cm para los primeros trabajos de parto y los subsecuentes. Recomienda que se debe informar a las mujeres que no se ha establecido una duración estándar de la fase latente del período de dilatación y que puede variar ampliamente de una mujer a otra (9).

**La Fase Activa**

Se caracteriza por contracciones regulares e intensas con una velocidad de dilatación más rápida. La fase latente puede superponerse con los síntomas prodrómicos. La fase activa se define:

- Según la GPC la definición de la fase activa como el periodo del parto que transcurre entre los 4 y los 10 cm. de dilatación y se acompaña de dinámica regular.

- Según la SEGO la mujer tiene dinámica regular, borramiento cervical > 50 % y dilatación 3-4 cm (3) y termina con la dilatación completa.

- Según la OMS el período de dilatación activa se caracteriza por contracciones uterinas dolorosas y regulares con un grado importante de borramiento y dilatación más rápida del

cuello uterino desde los 5 cm hasta la dilatación total para los primeros trabajos de parto y los subsecuentes.

La duración de la fase activa del período de dilatación activa (desde los 5 cm hasta la dilatación total del cuello uterino) generalmente no excede las 12 h en los primeros partos y, normalmente, no excede las 10 h en los partos subsecuentes según la OMS. La GPC establece la variabilidad según la paridad: primíparas, la duración media es de alrededor de 8 h, mientras que en las multíparas es de alrededor de 5 h.

Según el documento publicado por la National Institute for Health and Care Excellence (NICE) en 2014, la primera fase del parto en primigestas puede durar de 8 h hasta 18 h, mientras que a partir del segundo parto la media es de 5 h hasta 12 h (10).

### Fase de Expulsivo (segunda etapa del parto) (5,10)

La segunda etapa del parto o periodo expulsivo es aquella que transcurre entre el momento en que se alcanza la dilatación completa y el momento en que se produce la expulsión fetal. A su vez se subdivide en dos fases:

- Periodo de expulsivo pasivo: dilatación completa del cuello, antes o en ausencia de contracciones involuntarias de expulsivo. Según la GPC su duración normal en primíparas es de 2h con o sin analgesia epidural y de 1h en multíparas sin analgesia epidural y de 2h con analgesia epidural.

- Periodo expulsivo activo cuando: el feto es visible o existen contracciones de expulsivo en presencia de dilatación completa o pujos maternos en presencia de dilatación completa

con ausencia de contracciones de expulsivo. La duración normal en primíparas sin analgesia epidural es de 1h y de 2h con analgesia epidural, mientras que en multíparas es de 1h con o sin analgesia.

Durante el expulsivo activo es el momento de realizar pujos maternos, la mujer puede realizarlo de dos maneras: espontanea o dirigida. Según la OMS se debe alentar y asistir a las mujeres en el periodo de expulsivo para que sigan su propia necesidad de pujar.

- Pujos espontáneos: cuando la mujer nota la sensación de presión y siente la necesidad de pujar, lo hace libremente a glotis abierta en espiración, son pujos cortos de unos 5 segundos.

- Pujos dirigidos: el profesional dirige a la mujer para que realice el pujo en inspiración, a glotis cerrada y continuo durante 30 segundos, repitiéndolo 2 o 3 veces en una misma contracción.

Durante el pujo dirigido se realiza la maniobra de Vasalva, esta se utiliza para facilitar el descenso del feto en casos en los que las madres tienen bloqueo sensitivo-motor debido a la analgesia raquídea y no sienten el impulso de pujar. Sin embargo, los posibles efectos adversos de la maniobra de Valsalva, como el aumento de la presión intraabdominal y la apnea que experimenta la gestante, pueden afectar la oxigenación fetal y aumentar las lesiones o debilitar la musculatura del suelo pélvico materno. Son dos los momentos en los que se puede realizar la maniobra de Valsalva:

- Pujo tardío: el inicio del pujo se realiza después de 90 minutos de haber alcanzado la dilatación completa, y se permite a la mujer no pujar hasta que sienta la necesidad.

- Pujo precoz: el inicio del pujo es inmediatamente después de haber alcanzado la dilatación completa.

Existe controversia en cuando se debe dirigir los pujos maternos durante la segunda etapa del parto. Aunque se debate cada vez más sobre los beneficios de dirigir los pujos, el uso generalizado de la analgesia neuroaxial hace que a menudo sea necesario hacerlo (11).

El estudio realizado por Lee et al. (12) concluyen que el empuje dirigido está asociado con una mayor duración de la segunda etapa del trabajo de parto y un mayor riesgo de resultados neonatales adversos. El estudio sugiere que, en ausencia de analgesia regional, las mujeres deben ser apoyadas para seguir sus propios impulsos de expulsión.

En cambio, en un ensayo controlado aleatorizado (13) en el que comparan las técnicas de empuje espontáneo y de Valsalva concluyen en que parecen ser comparables en cuanto a la duración del parto, los resultados del suelo pélvico, perineales y neonatales.

Tanto la OMS (4) como la GPC del Sistema Nacional de Salud (SNS) publicada en 2010 (5), así como la guía actualizada de la NICE (10) en 2014, recomiendan el uso de pujo espontáneo y, en ausencia de éste, esperar a que se complete la fase pasiva de la segunda etapa del parto antes de iniciar los pujos dirigidos.

El documento de la Iniciativa de Parto Normal realizado por la FAME en 2007 (2) señala que el inicio temprano del pujo durante el parto puede tener efectos negativos, como alteraciones hemodinámicas en la madre y el feto, cambios en el equilibrio ácido-base, mayor riesgo de lesiones en el suelo pélvico y una mayor incidencia de partos instrumentados. Por otro lado, esperar el descenso pasivo del feto parece ser beneficioso, ya que se asocia con una mayor

tasa de partos espontáneos, menor fatiga materna, menor riesgo de traumatismos perineales, incontinencia y futuros prolapsos pélvicos.

## Fase de Alumbramiento (tercera etapa del parto)

El manejo de la tercera etapa del parto se refiere al período inmediatamente posterior al nacimiento del neonato y antes de la expulsión de la placenta. Dos enfoques principales el manejo activo y el manejo fisiológico o expectante (3,5,10):

- El manejo expectante se caracteriza por un enfoque no intervencionista, en el cual se espera que la placenta se separe y sea expulsada de forma espontánea. Este enfoque todavía se utiliza ampliamente, y su elección se basa en varios factores. Algunas mujeres desean tener una experiencia de parto más natural, sin intervenciones médicas innecesarias. Además, se cree que el manejo activo no es necesario en mujeres de bajo riesgo, y hay un deseo de evitar los posibles efectos secundarios asociados con el uso de medicamentos uterotónicos habituales, que estimulan la contracción uterina.

- El manejo activo generalmente implica la intervención de una matrona o médico. Este enfoque tiene como principal objetivo reducir la incidencia de la hemorragia posparto (HPP), que es una complicación potencialmente grave. Se utiliza una serie de intervenciones, como la administración de medicamentos uterotónicos, la tracción controlada del cordón umbilical y el masaje uterino, para acelerar la expulsión de la placenta y prevenir la HPP.

Sin embargo, existe controversia en relación con el manejo activo, especialmente en lo que respecta al pinzamiento precoz del cordón umbilical. Algunos estudios sugieren que el pinzamiento tardío del cordón umbilical puede tener beneficios para el recién nacido, como una mayor transferencia de sangre y nutrientes de la placenta (14–16).

Cada enfoque tiene sus propias ventajas e inconvenientes, y la elección del método adecuado dependerá de la situación clínica y las preferencias de la mujer. La GPC y la SEGO recomiendan el manejo activo del alumbramiento (3,5).

# *El partograma*

Un partograma es una herramienta gráfica utilizada para registrar y monitorear el progreso del trabajo de parto la gestante. Es una forma de representar de manera visual y sistemática la información relevante sobre el trabajo de parto, lo que permite evaluar de manera objetiva y tomar decisiones informadas sobre la atención obstétrica.

El partograma generalmente se compone de una serie de gráficas que representan diferentes aspectos del trabajo de parto, como la dilatación cervical, la frecuencia y duración de las contracciones uterinas, la frecuencia cardíaca fetal y la administración de medicamentos o intervenciones realizadas durante el proceso.

El objetivo principal del partograma es proporcionar una forma estandarizada de monitorear el trabajo de parto y detectar posibles complicaciones o desviaciones del progreso normal. Al registrar regularmente los datos en el partograma, los profesionales de la salud pueden identificar patrones anormales o problemas emergentes y tomar medidas adecuadas para garantizar la seguridad tanto de la madre como del feto.

Es importante destacar que el partograma debe ser utilizado por personal capacitado y en entornos donde se pueda realizar una vigilancia continua del trabajo de parto. Además, su interpretación y uso deben basarse en pautas clínicas y protocolos establecidos (9,10).

Se ha debatido ampliamente sobre el uso rutinario del partograma en el manejo del trabajo de parto (17,18). Sin embargo, en los últimos años se ha cuestionado la validez de algunos de sus componentes. En general, al comparar el uso del partograma con la no utilización del mismo, se ha observado una disminución en la proporción de partos con una duración superiora 18 horas, una reducción en el uso de oxitocina, una menor incidencia de sepsis postparto y una mayor tasa de partos vaginales espontáneos. Sin embargo, no se han encontrado diferencias significativas en la tasa de cesáreas, partos instrumentales y puntajes del test de Apgar

menores a 7 a los 5 minutos (2).

Estudios recientes sugieren que los criterios propuestos en los años 50 para el progreso de la dilatación (en los cuales se basan las líneas de alerta y líneas de acción del partograma) podrían ser demasiado estrictos (18–20). En otras palabras, no se recomienda utilizar los límites de velocidad de dilatación de 1 cm/h durante la fase activa de la primera etapa del parto en mujeres que comienzan el trabajo de parto de forma espontánea, ya que esto podría llevar a intervenciones innecesarias debido a la percepción errónea de un progreso lento del parto. Sin embargo, se sugiere seguir utilizando estas líneas de alerta y acción en entornos donde no hay centros de referencia para intervenciones obstétricas, en cuyo caso el partograma se debe comenzar a utilizar a partir de los 5 cm de dilatación con una línea de acción de 4 horas para monitoreo del avance del trabajo de parto (9,17).

El proceso de parto varía de mujer a mujer y no siempre progresa de manera lineal. Durante este proceso, las mujeres experimentan dolor perineal y lumbar, más intenso en primíparas. El dolor del parto es uno de los más intensos que una mujer puede experimentar, y su manejo no solo se enfoca en el alivio sintomático, sino también en los cambios fisiológicos que produce en la madre y el feto, por tanto, la valoración de este parámetro debe de estar siempre incluida en el partograma.

## Parámetros incluidos en el partograma

- Gráfica de dilatación cervical: Ante la sospecha de progreso lento del parto, es importante valorar los patrones de la dilatación y realizar una evaluación cuidadosa que excluya el desarrollo de complicaciones como la desproporción pélvico-cefálica (DPC) o antecedentes de la mujer y del curso de la gestación de interés para la evolución del parto.

- Parámetros básicos de la estática fetal: Altura de la presentación, posición de la cabeza fetal y actitud de flexión o deflexión.

- Estado de la bolsa amniótica y características del líquido amniótico si estuviese rota (cantidad y color).

- Parámetros del bienestar materno: Frecuencia cardiaca, tensión arterial, temperatura, diuresis, control del dolor (método utilizado y eficacia), analíticas realizadas durante el trabajo de parto como analíticas de orina, saturación de oxígeno o glucemia capilar.

- Parámetros del bienestar fetal: Interpretación periódica de la monitorización electrocardiográfica continua o de la auscultación intermitente, eventos e intervenciones que pueden afectar al patrón de la frecuencia cardiaca fetal (tacto vaginal, amniorrexis, administración de analgesia epidural, colocación electrodo fetal interno, estimulación de calota fetal, toma de pH de calota fetal, etc.). Además, se debe de incluir una valoración de la dinámica uterina.

- Administración de líquidos intravenosos y de medicación (oxitocina, tocolíticos, espasmolíticos, antibióticos, antitérmicos, etc.).

- Parto en movimiento: Se debe de registrar el uso de esferodinamia, deambulación y las diferentes posturas maternas utilizadas.

- Uso de métodos alternativos como el uso de la hidroterapia debe quedar registrado así como el deseo materno de realizar la inmersión en el agua y el consentimiento informado previo firmado u oral (21,22).

# *Adaptación neonatal extrauterina*

La adaptación neonatal extrauterina (23-25), también conocida como transición neonatal, se refiere al proceso que experimenta un neonato al pasar de la vida intrauterina a la vida extrauterina después del nacimiento. Durante el embarazo, el feto recibe oxígeno y nutrientes a través de la placenta y depende completamente de la madre para su supervivencia. Sin embargo, una vez que nace, el neonato debe comenzar a respirar por sí mismo y a recibir nutrición.

La adaptación neonatal extrauterina implica una serie de cambios fisiológicos y anatómicos que permiten al recién nacido sobrevivir y funcionar fuera del útero. A continuación, se describen algunos aspectos clave de esta adaptación:

- Respiración: Después del nacimiento, el neonato debe llenar sus pulmones de aire por primera vez. Esto se desencadena por el aumento del dióxido de carbono en la sangre y la disminución del nivel de oxígeno. El recién nacido comienza a respirar, y los pulmones se expanden y comienzan a funcionar. El líquido amniótico presente en los pulmones se reabsorbe y se reemplaza por aire.

- Circulación: Durante el embarazo, la circulación sanguínea del feto es diferente a la de un adulto. La sangre oxigenada proviene principalmente de la placenta a través del cordón umbilical. Después del nacimiento, la circulación fetal se cierra y se establece la circulación pulmonar y sistémica independiente. Esto ocurre debido a cambios en la presión y resistencia vascular, así como al cierre de estructuras como el conducto arterioso y el foramen oval.

- Temperatura: El recién nacido debe mantener su temperatura corporal adecuada, ya que ya no está protegido por el ambiente constante y cálido del útero materno. Los neonatos pueden perder calor rápidamente a través de la piel. Para ayudar a mantener la temperatura, se les seca, se les coloca en contacto con la piel de la madre y, a veces, se les proporciona calor adicional mediante el uso de una fuente de calor radiante.

- Alimentación: Después del nacimiento, el recién nacido necesita recibir nutrición a través de la alimentación. Inicialmente, la leche materna se administra con frecuencia y la leche artificial (si es el deseo materno) se administra en cantidades pequeñas y frecuentes, ya que el sistema digestivo del neonato es inmaduro. Con el tiempo, el sistema digestivo madura y se puede establecer una rutina de alimentación más regular.

Es importante destacar que la adaptación neonatal extrauterina puede llevar tiempo y que cada recién nacido es diferente. En algunos casos, los recién nacidos pueden necesitar apoyo adicional, como asistencia respiratoria o cuidados especiales en una unidad de cuidados intensivos neonatales, especialmente si son prematuros o presentan problemas de salud al nacer.

# *Técnicas de analgesia no farmacológica*

La analgesia no farmacológica (26-28) durante el parto se refiere a una variedad de técnicas y métodos utilizados para aliviar el dolor sin el uso de medicamentos. Estas estrategias se centran en el manejo del dolor a través de intervenciones físicas, psicológicas y ambientales, y son populares entre las mujeres que desean un parto más natural. Las técnicas más usadas actualmente durante el parto son:

- Técnicas de Respiración y Relajación: diversos métodos como la respiración controlada, la meditación y la relajación progresiva se utilizan para manejar el dolor. Estas técnicas ayudan a disminuir la ansiedad y el estrés, reduciendo la percepción del dolor a través de la distracción y la relajación muscular. Mejoran la capacidad de la mujer para manejar el dolor de manera efectiva, promoviendo una experiencia de parto más positiva.

- Masaje y Acupresión: El masaje terapéutico y la acupresión aplicada a puntos específicos del cuerpo pueden aliviar el dolor de las contracciones. El masaje mejora la circulación sanguínea y la relajación muscular, mientras que la acupresión estimula puntos específicos para liberar endorfinas, los analgésicos naturales del cuerpo. Contribuye a la reducción del dolor, disminución de la tensión muscular y mejora del bienestar general.

- Hipnosis y Técnicas de Hipnobirthing: Estas técnicas utilizan sugestiones positivas y técnicas de relajación profunda para ayudar a las mujeres a manejar el dolor. La hipnosis puede alterar la percepción del dolor y promover una profunda relajación, lo que facilita un parto más tranquilo y menos doloroso. Contribuye a la disminución del miedo y la ansiedad, reducción del dolor percibido y una experiencia de parto más empoderada.

- Movimientos y Posicionamiento: La libertad para moverse y adoptar diferentes posiciones durante el trabajo de parto puede aliviar el dolor y facilitar el proceso del parto.

Cambiar de posición y moverse ayuda a encontrar posturas más cómodas, reduce la presión en áreas específicas y mejora la alineación del bebé en el canal de parto. Los beneficios son: alivio del dolor, aceleración del trabajo de parto y mejora de la eficacia de las contracciones.

- Estimulación Eléctrica Nerviosa Transcutánea (TENS): Los dispositivos TENS aplican pequeñas corrientes eléctricas a través de electrodos colocados en la piel para aliviar el dolor. La estimulación eléctrica puede bloquear las señales de dolor al cerebro y promover la liberación de endorfinas. Entre sus beneficios se encuentra la reducción del dolor sin efectos secundarios farmacológicos, fácil de usar y controlar por la mujer.

- Aromaterapia y Musicoterapia: El uso de aceites esenciales y música relajante puede crear un ambiente calmado y reducir el dolor. La aromaterapia y la musicoterapia pueden reducir el estrés y la ansiedad, mejorando el estado de ánimo y la percepción del dolor.

- La Hidroterapia como objeto de nuestro estudio va a ser detallada a continuación en los siguientes apartados.

**Los beneficios de la analgesia no farmacológica son los siguientes:**

- Empoderamiento Materno: Estas técnicas pueden empoderar a las mujeres al darles un mayor sentido de control sobre su experiencia de parto.

- Reducción de Intervenciones Médicas: Al disminuir la necesidad de analgésicos farmacológicos, se reduce la posibilidad de efectos secundarios y complicaciones asociadas.

- Mejora de la Satisfacción: Las mujeres que utilizan métodos no farmacológicos a menudo reportan una mayor satisfacción con su experiencia de parto.

- Facilitación del Proceso Fisiológico: Estas técnicas apoyan el proceso natural del parto, permitiendo una experiencia más fluida y menos intervenida.

# *La hidroterapia durante el parto*

La hidroterapia es una forma de terapia que utiliza el agua en diferentes formas y temperaturas para tratar una variedad de afecciones y mejorar el bienestar general. Puede incluir el uso de baños, duchas, inmersiones, chorros de agua, saunas, y envolturas húmedas. La hidroterapia se emplea por sus efectos beneficiosos, entre los que podemos encontrar:

- **Relajación muscular**: El calor del agua puede ayudar a relajar los músculos y reducir la tensión (29).

- **Mejora de la circulación**: La inmersión en agua caliente o la alternancia entre agua caliente y fría puede mejorar la circulación sanguínea (30).

- **Alivio del dolor**: Puede aliviar el dolor asociado con condiciones como la artritis, lesiones deportivas, y dolor crónico (31).

- **Reducción del estrés**: La hidroterapia puede ser muy relajante, ayudando a reducir el estrés y la ansiedad (32).

- **Mejora la rehabilitación**: Se utiliza frecuentemente en programas de rehabilitación para mejorar la movilidad y la función después de una lesión o cirugía (33)

## Historia y evolución de la hidroterapia

El parto era considerado un evento natural y manejado de manera instintiva y solitaria en sociedades primitivas, aunque en algunas religiones era visto como un castigo. Con el tiempo, el concepto del dolor en el parto ha evolucionado. La hidroterapia ha sido utilizada durante el parto desde hace siglos. El uso de agua como medio terapéutico es una práctica ancestral que data de civilizaciones antiguas como China, Egipto, Japón, Grecia y Roma (34). Estas culturas utilizaban el agua para tratar afecciones físicas y psicológicas, y existen referencias bibliográficas (34) que mencionan su uso durante el parto para proporcionar relajación y alivio del dolor.

Hasta los siglos XVI y XVII la hidroterapia se entendió y aceptó científicamente para las afecciones musculoesqueléticas, aunque todavía quedaban muchas preguntas sin respuesta sobre los beneficios del agua en medicina (35). El primer escrito conservado sobre la inmersión en agua caliente durante el parto se encuentra publicado en la revista Annales de la Societe de Medicine Pratique de Montepellier, esta fue la primera publicación médica en describir un parto bajo el agua en el año 1.805 (36).

El primer nacimiento en el agua registrado ocurrió en Francia a principios del siglo XIX. Años más tarde, Frédrérick Leboyer, un obstetra francés, introdujo la idea de bañar a los bebés en agua después del parto. Sostuvo que esto podría ayudar a minimizar la angustia del parto en el neonato (37,38). Leboyer estaba interesado en hacer que la transición de la vida intrauterina a la extrauterina fuera lo más natural posible porque creía que esto podría influir en la vida futura del recién nacido (38).

Entre 1962 y 1985 Michael Odent, un obstetra francés antiguo discípulo de Leboyer, introduce la hidroterapia en la unidad francesa del hospital de Pithiviers, buscando un entorno menos medicalizado y más natural para el parto (37).

Sólo durante los años comprendidos entre 1985 y 1989, se calcula que se realizaron más de 150.000 partos bajo el agua en todo el mundo (39).

En el Reino unido se publica en 1992 el informe Winterton y a continuación en 1993 el informe *Changing Childbirth* del departamento de salud , estos informes fueron muy importantes ya que recomienda la instalación de una bañera para partos en los hospitales, afirmaban que la mujer podía adquirir la postura en la que dar a luz y también el uso del agua durante el parto convirtiéndose así la hidroterapia en un recurso disponible para las gestantes durante su parto, si así fuese el deseo de la gestante de utilizarla durante su parto. Elogiaron estas publicaciones por consagrar el concepto de atención centrada en la mujer y crearon iniciativas prácticas para respaldar sus recomendaciones principales, lo que fue el impulso ala adopción de esta práctica en muchas unidades de maternidad (29,32,37,40).

A partir de la década de 1990, el uso de la hidroterapia durante el parto se fue extendiendo gradualmente a otros países, como Estados Unidos y Canadá. Hoy en día, es una opción cada vez más aceptada y solicitada por las mujeres que buscan un parto más natural y respetuoso con el proceso fisiológico (34,41).

En 2010, el Programa de Humanización de la Atención Perinatal se activó en el Hospital Costa del Sol, con sillas de parto vertical y la instalación de una bañera en su paritorio para la hidroterapia durante el parto en las mujeres que lo deseasen.

El Hospital público de Torrejón de Ardoz en Madrid fue el primer hospital público en instalar bañera en su unidad obstétrica y hacer uso de la hidroterapia durante el parto, realizando su primer parto con uso de la inmersión en agua en el año 2012.

## Mecanismos de acción de la hidroterapia durante el parto

La hidroterapia durante el trabajo de parto actúa a través de varios mecanismos fisiológicos y psicológicos que pueden contribuir a una experiencia de parto más cómoda y manejable para la mujer. A continuación, se describen los principales mecanismos de acción de la hidroterapia en el contexto del trabajo de parto (34,39,42–44) :

**Alivio del Dolor**

- Temperatura del Agua:

  - El agua caliente, generalmente mantenida alrededor de 37.4°C, ayuda a relajar los músculos y mejorar la circulación sanguínea. Esta relajación muscular reduce la tensión y el dolor asociado con las contracciones uterinas.

  - La inmersión en agua caliente puede estimular la liberación de endorfinas, que son analgésicos naturales del cuerpo, lo que contribuye a una mayor tolerancia al dolor.

- Reducción de la Gravedad:

  - La flotabilidad del agua disminuye la presión sobre el cuerpo, especialmente en la espalda y las articulaciones, lo que puede aliviar el dolor. La reducción de la gravedad también facilita el movimiento y permite adoptar posiciones más cómodas, lo que puede ayudar a manejar mejor el dolor durante las contracciones.

**Relajación y Reducción del Estrés**

- Entorno Tranquilo:

  - El entorno acuático puede proporcionar un ambiente más tranquilo y privado, lo que reduce el estrés y la ansiedad. La sensación de flotabilidad y el sonido del agua pueden tener un efecto calmante, similar al de la terapia de relajación.

  - La reducción del estrés y la ansiedad puede mejorar la percepción del dolor y aumentar la capacidad de la mujer para concentrarse y manejar las contracciones de manera más efectiva.

**Facilitación del Proceso de Parto**

- Mejora del Flujo Sanguíneo:

  - El calor del agua mejora la circulación sanguínea, lo que puede favorecer un mejor suministro de oxígeno a los músculos uterinos y al feto. Una mejor oxigenación de los tejidos puede contribuir a una mayor eficiencia de las contracciones y una progresión más suave del trabajo de parto.

- Facilitación de la Dilatación Cervical:

  - La inmersión en agua caliente puede ayudar a relajar el cuello uterino y los músculos pélvicos, lo que puede facilitar la dilatación cervical. Algunas investigaciones

sugieren que la hidroterapia puede acelerar la fase de dilataciónde l trabajo de parto (43,45,46).

- Libertad de Movimiento:

  - La flotabilidad en el agua permite a las mujeres moverse más libremente y adoptar diferentes posiciones, lo que puede ayudar a optimizar el alineamiento del bebé en el canal de parto y mejorar la eficiencia de las contracciones uterinas. Las posiciones verticales, como sentarse o ponerse de cuclillas en el agua, pueden favorecer la gravedad y la presión descendente, facilitando la progresión del parto.

**Reducción de la Necesidad de Intervenciones Médicas**

- Menor Uso de Analgesia:

  - La hidroterapia puede reducir la necesidad de analgesia epidural y otros medicamentos para el dolor. La combinación de alivio físico del dolor y relajación psicológica puede hacer que las mujeres se sientan más capaces de manejar el dolor sin recurrir a intervenciones farmacológicas.

  - Al reducir el uso de analgesia y otros medicamentos, también se pueden evitar los efectos secundarios y las complicaciones asociadas con estos tratamientos, beneficiando tanto a la madre como al feto.

**Beneficios Emocionales y Psicológicos**

- Empoderamiento Materno:

  - La hidroterapia puede proporcionar una mayor sensación de control y empoderamiento durante el parto. El ambiente más natural y la capacidad de moverse libremente pueden hacer que las mujeres se sientan más seguras y confiadas en su capacidad para dar a luz.

  - Una experiencia de parto positiva y menos intervenida puede contribuir a una mejor recuperación posparto y a una mayor satisfacción materna con la experiencia del parto.

## Beneficios de la hidroterapia durante el trabajo de parto

La hidroterapia, específicamente enfocada en mujeres embarazadas durante el parto, ha demostrado ser una opción cómoda y útil para muchas mujeres (47). La inmersión en agua caliente ofrece numerosos beneficios para la madre y el neonato, mejorando la experiencia del parto y reduciendo la necesidad de intervenciones médicas (34).

La experiencia de un parto en el agua es muy deseada por muchas familias (48), ya que permite un nacimiento natural y fisiológico, y puede empoderar a las mujeres mejorando sus habilidades durante el parto (49).

Los principales beneficios atribuidos a la hidroterapia (21,34,48,50) incluyen:

- Reducción del dolor y la tensión durante las contracciones
- Mejor relajación y movilidad de la madre
- Disminución de la necesidad de intervenciones médicas
- Entorno más cálido y tranquilo para el nacimiento

Numerosos estudios han demostrado los beneficios del agua durante el parto, incluyendo una reducción en el uso de epidurales, una mejor capacidad para aliviar el dolor, duración del parto más corto, un mayor sentido de control y mayor comodidad.(41,43,50–58) Una revisión Cochrane(34) que incluyó 15 ensayos con 3663 mujeres comparando la inmersión en agua con la no inmersión identificó beneficios físicos y emocionales, como un umbral de dolor más alto, menos intervenciones médicas, mayor relajación y satisfacción con la experiencia de parto.

Sin embargo, existe controversia sobre los resultados neonatales y la seguridad del bebé. Asociaciones como el Colegio Americano de Obstetras y Ginecólogos (ACOG) y la Academia Americana de Pediatría (AAP) (59) publicaron en 2014 su artículo en el que argumentaban que los riesgos potenciales para el recién nacido superaban los beneficios para la mujer. No obstante, actualmente la existencia de revisiones sistemáticas y estudios recientes publicados (34,60) no sugieren que los resultados sean peores para los neonatos nacidos en agua y concluyen que el parto en agua no está asociado con resultados neonatales adversos ni con un mayor riesgo de desgarros perineales extensos o hemorragias posparto. Otros resultados adversos neonatales estudiados (60), como el distrés respiratorio, anemia, sepsis, encefalopatía hipóxico-isquémica, asfixia o muerte, no mostraron diferencias significativas entre los grupos que usaron inmersión en agua y los que no.

En 2014, la Asociación Española de Pediatría (AEP) publicó un informe que menciona el uso de la inmersión en agua durante la primera etapa del parto en casos de gestaciones no complicadas y a término. Este informe destaca que dicha técnica reduce la necesidad de

analgesia farmacológica y acorta la duración del trabajo de parto, aunque no está asociada a mejoras en los resultados perinatales.

Según la publicación: *Inmersión en agua durante el parto. Ministerio de Sanidad. Servicio de Evaluación de Tecnologías Sanitarias del País Vasco; 2022. Informes de Evaluación de Tecnologias Sanitarias: OSTEBA* (21) recoge en su anexo XI aquellos posibles beneficios que dieron como respuesta a un cuestionario realizado a los profesionales y que detallamos a continuación:

**Posibles beneficios en la fase de dilatación**

- Aumenta la relajación y disminuye el dolor.
- Mejora la movilidad.
- Disminuye la necesidad de analgesia epidural.
- Favorece la percepción de normalidad y autocontrol sobre el proceso del parto, proporcionando una experiencia más satisfactoria del mismo. Aumento del grado de satisfacción materna.
- Reduce la necesidad del uso de oxitocina sintética e intervenciones obstétricas.
- Menor ansiedad materna.
- Optimización de la fisiología del parto.
- Aumento de la secreción de oxitocina secundaria a la relajación y liberación de serotonina. Disminuyendo la necesidad del uso de oxitocina exógena.
- Aumento de la vascularización uterina produciendo contracciones uterinas más efectivas.
- Reducción en el tiempo de la primera fase del parto.
- Reduce la intensidad de la contracción y esta se mantiene eficaz e intensa si se entra en el momento adecuado según evolución de cada gestante.
- No compresión externa en la vena cava inferior, lo que favorece un aumento de la circulación sanguínea en el útero, produciendo una mayor oxigenación del tejido muscular y, por tanto, contracciones más eficientes; la sangre que llega a la placenta aumenta y se incrementa la oxigenación fetal; la vasodilatación leve que ocurre en el

agua reduce la presión arterial y aumenta el pulso materno provocando un aumento de oxigenación en útero y feto.

- El feto tiene menos manipulación, evoluciona de forma natural y fisiológica.

**Posibles beneficios en la fase de expulsivo**

Incluye las mismas que durante la dilatación ya que contribuye a favorecer el expulsivo, facilitando su fisiología y la adaptación óptima del neonato a la vida extrauterina y añade las siguientes:

- Facilita la distensión de los tejidos perineales.
- Acorta el tiempo de expulsivo.
- Disminuye el uso de analgesia loco-regional.
- Disminuye el número de desgarros perineales.
- Disminuye las episiotomías.
- Proporciona alivio del dolor.
- Aumenta el confort materno.
- Ayuda a la adaptación a la vida extrauterina del recién nacido/a.
- Supone una experiencia de parto positiva.
- Proporciona autonomía, mayor control materno de los pujos, las mujeres se sienten con el control.
- Mejora la satisfacción materna en aquellas madres que desean parto en el agua.
- Las mujeres llevan mejor el periodo de transición del parto.
- Mejora la movilización durante el expulsivo, las mujeres pueden optar por distintas posiciones para los pujos.
- Menos intervenciones por parte de los profesionales.(21)

Posibles contraindicaciones según *Inmersión en agua durante el parto. Ministerio de Sanidad. Servicio de Evaluación de Tecnologías Sanitarias del País Vasco; 2022. Informes de Evaluación de Tecnologias Sanitarias: OSTEBA* (21):

**Posibles contraindicaciones de la inmersión en agua en la fase de dilatación:**

- Atención por profesionales no familiarizados con el uso del agua en el parto.
- Inclusión inadecuada de mujeres candidatas a usar la bañera.
- Falta de control riguroso de la calidad del agua.
- Prolapso de cordón en amniorrexis espontánea.
- Riesgo de pérdida de bienestar fetal (RPBF), riesgo de infección materna y/o fetal, alteraciones en la termorregulación materno-fetal.
- Prolongación del tiempo de dilatación si se realiza sin dinámica uterina instaurada.
- Disminución de las contracciones y tensión arterial por la relajación y el calor del agua.
- Hipertermia y deshidratación materna, lo que puede afectar la perfusión uteroplacentaria y la frecuencia cardíaca fetal.
- Complicaciones agudas que requieren sacar a la paciente de la bañera.
- Dificultad en la monitorización y alivio insuficiente del dolor.

**Posibles contraindicaciones en la fase de expulsivo:**

- Detección inadecuada de contraindicaciones específicas del expulsivo en el agua.
- Falta de formación en emergencias en la bañera.
- Riesgo de infección y aspiración neonatal.
- Detención del expulsivo y rotura de cordón.
- Dificultad en la reacción ante situaciones patológicas, pero que se solventarían con adecuada organización y flujograma de actuación.
- Dificultad para realizar maniobras de urgencia.
- Hemorragias en la madre y dificultad para ayudar a salir a la madre si tiene movilidad limitada.

## Actualmente

Hoy en día, la hidroterapia durante el parto se ofrece en muchas unidades de maternidad alrededor del mundo. Las bañeras de parto están diseñadas para ser higiénicas, seguras y cómodas y están disponibles en muchos hospitales y centros de maternidad, y el uso de piscinas portátiles de parto también se ha vuelto común en entornos de parto en casa.

Organizaciones profesionales como el Royal College of Midwives en el Reino Unido y la American College of Nurse-Midwives han desarrollado guías para la práctica segura de la hidroterapia durante el parto, incluyendo recomendaciones sobre la temperatura del agua, el monitoreo materno y fetal, y los criterios de exclusión para su uso.

En 2010 se publicó en España "La Guía de Práctica Clínica de Atención al Parto Normal" (5) esta guía recomienda la inmersión en agua caliente como un método eficaz para aliviar el dolor durante la fase tardía de la primera etapa del parto, con una fuerte recomendación. Esta recomendación se basó en la Guía de Práctica Clínica NICE (61), que señala que "no hay diferencias significativas en los resultados adversos (tasas de parto vaginal instrumentado, cesáreas, trauma perineal como episiotomía o desgarros de segundo a cuarto grado, número de recién nacidos con Apgar menor de 7 a los 5 minutos e ingresos en la unidad neonatal) al utilizar o no la inmersión en agua, ni tampoco en la duración del parto".

Recientemente en 2022 se publica *"inmersión en agua durante el parto" Informes de evaluación de tecnologías sanitarias realizado por el Servicio de Evaluación de Tecnologías Sanitarias del País Vasco (OSTEBA)* en el marco de la financiación del Ministerio de Sanidad de España en el cual se realizó una revisión sistemática para evaluar: 1) la eficacia, efectividad y seguridad de la inmersión en el agua durante el parto y 2) los valores y preferencias de las mujeres que habían tenido un parto en el agua. Debido a la existencia de dudas relacionadas sobre todo con la seguridad del recién nacido/a, este informe responde según el análisis de

la evidencia, y así determina si la inmersión en agua durante el parto es segura y eficaz, para la madre y para el neonato (11).

Sus conclusiones se resumen a continuación:

- La inmersión en agua durante la primera etapa del parto reduce el uso de analgesia regional y el dolor, pero tiene poco efecto en el número de partos vaginales eutócicos o el trauma perineal. En la segunda etapa, no hay diferencias en partos vaginales, trauma perineal, ni en la salud neonatal, salvo una mayor satisfacción en partos en agua.

- Las mujeres asocian beneficios al parto en agua. Las matronas destacan la necesidad de recursos adecuados, protocolos homogéneos, formación y apoyo de todos los profesionales del parto para asegurar la seguridad.

- Las mujeres consideran críticos los desenlaces maternos de mortalidad, infección, pérdida de sangre, tipo de parto y trauma perineal (grados 3 y 4). Todos los desenlaces fetales/neonatales fueron valorados como críticos.

- Existe variabilidad en la oferta de inmersión en agua durante el parto en los hospitales del Sistema Nacional de Salud, con algunas diferencias en su uso durante las distintas fases del parto.

- Se recomienda mejorar la información sobre alivio del dolor, establecer protocolos comunes, homogeneizar la formación, y aumentar los recursos para que todas las

mujeres tengan acceso seguro y satisfactorio a la inmersión en agua caliente durante el parto.

Este documento recoge también el número de partos atendidos por hospitales y años de experiencia en inmersión en agua durante el parto, a nivel nacional.

La tecnología y el diseño de las bañeras de parto han mejorado en seguridad, accesibilidad y comodidad para madres y personal médico. La investigación sigue explorando los efectos a largo plazo de la hidroterapia, las experiencias psicológicas de las mujeres que la eligen y posibles innovaciones tecnológicas, como el uso de sensores para el monitoreo continuo del bienestar fetal y materno (34,60,62).

En España, al menos 46 hospitales en 13 comunidades autónomas ofrecen la inmersión en agua durante el parto. Según los datos recogidos en "inmersión en agua durante el parto" Informes de evaluación de tecnologías sanitarias realizado por el Servicio de Evaluación de Tecnologías Sanitarias del País Vasco (OSTEBA), esta práctica puede implementarse eficazmente si se siguen meticulosamente los protocolos, se aplican criterios adecuados para seleccionar a las gestantes beneficiarias y se asegura la formación del personal en la identificación de riesgos y en los protocolos específicos (21).

## Consideraciones para la Implementación de la Hidroterapia en el Parto

La implementación de la hidroterapia durante el parto (34,63-66) revirequiere una planificación cuidadosay una serie de consideraciones para asegurar que se realice de manera segura y efectiva. A continuación, se detallan los principales requisitos:

1. Infraestructura y Equipamiento:

   - Instalación de bañeras o de parto adecuadas que cumplan con los estándares de higiene y seguridad. Disponibilidad de equipos para el llenado y vaciado rápido y eficiente del agua.

   - Mantenimiento y Limpieza: Protocolos estrictos para la limpieza y desinfección de las bañeras entre usos para prevenir infecciones.

   - Gestión de la disponibilidad de las instalaciones de hidroterapia para asegurar que estén accesibles cuando se necesiten.

2. Capacitación del Personal:

   - Formación Específica: Capacitación del personal obstétrico (matronas, enfermeras y obstetras) en el uso seguro y efectivo de la hidroterapia durante el parto. Formación en monitoreo fetal y materno durante el uso de la hidroterapia.

   - Protocolos de Emergencia: Instrucción en procedimientos de emergencia específicos para situaciones que puedan surgir durante el uso de hidroterapia (por ejemplo, dificultades para salir de la bañera en caso de emergencia).

3. Criterios de Selección para las Pacientes:

- Evaluación de criterios de inclusión: Definición de criterios para determinar qué mujeres son candidatas adecuadas para la hidroterapia. El primer criterio de inclusión es el deseo materno considerando sus actitudes y preferencias personales, culturales y necesidades individuales hacia el parto en el agua. Posiblescriterios favorables son:

  - Embarazo de bajo riesgo sin patología materna.
  - Gestación a término entre las semanas 37 y 42 completas.
  - Feto único.
  - Presentación cefálica.
  - Líquido amniótico claro.
  - Inicio espontáneo, estimulado o inducido (prostaglandinas) del parto.
  - Progresión favorable del parto.
  - Rotura prematura de membranas <24 horas.
  - Serología infecciosa negativa (Virus de la Inmunodeficiencia Humana (VIH), Hepatitis, Infecciones de transmisión sexual (ITS)).
  - Estreptococo del grupo B (SGB) negativo.
  - No signos de infección materna: fiebre, taquicardia.
  - Cumplir pauta antibiótica siguiendo el protocolo.
  - En caso de SGB (+), garantizar administración de la pauta antibiótica según el protocolo de profilaxis SGB del centro.
  - No administración de opiáceos durante las tres horas previas a la inmersión en el agua.
  - Debe haber recibido información profesional previa, preferiblemente durante la preparación al parto (matrona de Equipo de Atención Primaria).
  - Disponibilidad de recursos humanos: ratio matrona/gestante de 1:1.
  - Nivel de conciencia adecuado y capacidad para colaborar en todo el proceso.
  - La mujer se compromete a abandonar el agua si la matrona lo indica.
  - Factores de Riesgo que no afecten al momento del parto.
  - Formación del Personal: Formación específica a las matronas sobre parto en agua

- Generalmente, se excluyen las mujeres con embarazos de alto riesgo, Serologías positivas o desconocidas, fiebre o sospecha de infección materna, herpes genital activo o sospecha de infecciones de transmisión sexual, sangrado vaginal activo, uso de analgesia epidural o intradural, registro cardiotocográfico (RCTG) patológico y/o sospecha de pérdida de bienestar fetal, líquido amniótico meconial, presentación anormal del feto durante el parto.(21)

- Consentimiento Informado: ofrecer la información completa a las mujeres sobre los beneficios, riesgos y alternativas a la hidroterapia, asegurando que tomen una decisión informada.

4. Monitoreo y Seguimiento:

- Monitoreo Fetal y Materno: Utilización de técnicas de monitoreo fetal adecuado para asegurar el bienestar del bebé durante el uso de la hidroterapia. Monitoreo regular de los signos vitales de la madre y su bienestar general.

- Control de la Temperatura del Agua: Mantenimiento de la temperatura del agua alrededor de 37.4°C para asegurar comodidad y seguridad tanto para la madre como para el bebé.

Una vez evaluada la utilidad y los beneficios del uso de la hidroterapia durante el proceso departo, procedemos a describir y documentar nuestro estudio.

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# JUSTIFICACIÓN

El interés de las mujeres por estrategias no farmacológicas para el control del dolor durante el parto, como la hidroterapia, está en aumento. Este enfoque está ganando popularidad en España, donde varios hospitales han comenzado a ofrecer partos en el agua, alineándose con la tendencia de humanizar y desmedicalizar el parto.

Históricamente, la atención sanitaria ha estado marcada por una medicina paternalista y defensiva, afectando también a la asistencia obstétrica. En este contexto, los deseos y derechos de las mujeres han sido frecuentemente ignorados, debido a una excesiva medicalización y a prácticas defensivas de los profesionales, basadas en el "miedo legal". Esta dinámica ha relegado a las mujeres a un rol pasivo en la atención que reciben.

Esta situación ha propiciado un cambio en la atención sanitaria en el área materno-infantil. Se están introduciendo nuevas prácticas fundamentadas en la evidencia clínica, que otorgan mayor protagonismo a las mujeres y sus parejas. Conceptos como la toma de decisiones compartidas están ganando importancia, ampliándose la cartera de servicios ofrecidos por los hospitales. Estas incluyen medidas menos intervencionistas en la asistencia al parto, así como la implementación de nuevos protocolos y guías de práctica clínica más humanizadas.

Los estudios presentan resultados perinatales variados respecto al uso de hidroterapia durante el parto, lo que subraya la necesidad de realizar más investigaciones en este ámbito. Estos estudios constituyen la principal fuente de información para evaluar la seguridad e identificar posibles complicaciones; sin embargo, no existe suficiente evidencia de alto nivel para guiar la práctica del parto en el agua.

En España, hay pocos estudios realizados sobre la hidroterapia durante el parto debido a su baja frecuencia de uso en este contexto. Sin embargo, en el Reino Unido, esta alternativa es muy demandada y utilizada por las gestantes durante el parto. Sería relevante investigar el uso de la hidroterapia en España y comparar el número de partos atendidos con esta técnica frente a la asistencia convencional.

La inmersión en agua durante el trabajo de parto es una medida eficaz para mejorar la comodidad; sin embargo, los resultados del parto en el agua en el ámbito hospitalario no están bien documentados. En España, el uso de la hidroterapia en la segunda etapa del parto (expulsivo) no está generalizado, aunque sí se utiliza el agua durante la fase tardía de la primera etapa del parto. Cabe destacar que nuestro estudio no solo aportara evidencia científica a la investigación sobre la inmersión en agua, sino también la comparación con el uso del agua sin inmersión (como el uso de la ducha), lo cual es novedoso, ya que ninguno de los estudios revisados hasta el momento incluye esta variable.

Este estudio pretende estudiar si el uso de la hidroterapia durante la fase activa del parto y la fase de expulsivo disminuye los tiempos globales del parto y no se asocia con un aumento del riesgo para la madre o el recién nacido. Estos hallazgos servirán para la elaboración de una guía de práctica clínica para la asistencia al parto mediante el uso de hidroterapia.

# HIPÓTESIS

El uso de la hidroterapia durante el parto acorta la duración total del proceso. Aplicada en determinadas etapas del parto, la hidroterapia es segura tanto para la madre, al reducir el riesgo de resultados perineales adversos y hemorragia posparto, así como la percepcióndel dolor, como para el neonato, evidenciado por un puntaje de Apgar superior a 7 y una menor incidencia de ingresos en la unidad de cuidados intensivos neonatales debido a diagnóstico de sufrimiento fetal agudo.

# OBJETIVOS

## Objetivo general

Valorar como afecta el uso de la hidroterapia en los tiempos reales de parto y su asociación con los resultados maternos y neonatales en las embarazadas asistidas entre los años 2010-2020.

## Objetivos específicos

Para abordar los objetivos específicos planteados en esta tesis doctoral, los resultados de la investigación se han descrito y agrupado en los siguientes artículos científicos, cada uno de los cuales se enfoca en diferentes aspectos de los objetivos mencionados:

1. **Identificar las diferencias existentes en determinados indicadores del parto (percepción del dolor, terminación del parto, tiempos de parto), en función del uso de la hidroterapia, así como los factores potencialmente asociados a dichas diferencias**:

    - Este objetivo se aborda en el **Artículo 1**, cuyo objetivo es evaluar y comparar los efectos del uso de una bañera y una ducha terapéutica durante el parto en la percepción del dolor, el uso de analgesia epidural, la duración del parto y los resultados maternos y fetales.

- También se aborda en el **Artículo 2**, que tiene como objetivo principal evaluar el efecto de la hidroterapia durante el parto, específicamente en los tiempos de parto.

- Además, se incluye en el **Artículo 4**, cuyo objetivo principal es determinar los beneficios de la hidroterapia en los enfoques clínicos del parto y su aplicabilidad en el control del dolor. Los objetivos secundarios incluyen evaluar su impacto en la duración de la primera etapa del parto y la condición física de los recién nacidos.

2. **Describir y analizar los tipos de parto en las gestantes que utilizan hidroterapia, así como los factores asociados a mujeres que no utilizaron hidroterapia**:

- Los hallazgos relacionados con este objetivo se presentan en el **Artículo 5**, que realiza una revisión sistemática y síntesis de la evidencia contemporánea relacionada con el parto en el agua, con un enfoque específico en la segunda etapa del parto.

3. **Evaluar la influencia del uso de la hidroterapia en los parámetros neonatales (Apgar, ingreso en Unidad de Cuidados Intensivos de Neonatos y complicaciones fetales)**:

- Este objetivo es tratado en el **Artículo 3**, que tiene como objetivo principal determinar si el uso de hidroterapia en la primera etapa del trabajo de parto es seguro tanto para la madre como para el recién nacido. Los objetivos secundarios incluyen estudiar los resultados perinatales maternos y los resultados fetales del uso de la hidroterapia durante el parto.

- También se aborda en el **Artículo 4**, cuyo objetivo principal es determinar los beneficios de la hidroterapia en los enfoques clínicos del parto y su aplicabilidad en el control del dolor. Los objetivos secundarios incluyen evaluar su impacto en la duración de la primera etapa del parto y la condición física de los recién nacidos.

4. **Comprobar cómo influye la hidroterapia en los resultados maternos (estado perineal, hemorragia posparto, complicaciones maternas)**:

- Este objetivo se examina en el **Artículo 3**, cuyo objetivo principal es determinar si el uso de hidroterapia en la primera etapa del trabajo de parto es seguro tanto para la madre como para el recién nacido. Los objetivos secundarios incluyen estudiar los resultados perinatales maternos y los resultados fetales del uso de la hidroterapia durante el parto.

- También se incluye en el **Artículo 4**, cuyo objetivo principal es determinar los beneficios de la hidroterapia en los enfoques clínicos del parto y su aplicabilidad en el control del dolor. Los objetivos secundarios incluyen evaluar su impacto en la duración de la primera etapa del parto y la condición física de los recién nacidos.

5. **Explorar si el uso de la hidroterapia mejora la adherencia a la lactancia materna en el posparto**:

- Este objetivo se aborda en el **Artículo 1**, cuyo objetivo es evaluar y comparar los efectos del uso de una bañera y una ducha terapéutica durante el parto en la percepción del dolor, el uso de analgesia epidural, la duración del parto y los resultados maternos y fetales.

6. **Comparar los efectos maternos y fetales del uso de la hidroterapia según se emplee ducha o bañera**:

- Este objetivo se aborda en el **Artículo 1**, cuyo objetivo es evaluar y comparar los efectos del uso de una bañera y una ducha terapéutica durante el parto en la percepción del dolor, el uso de analgesia epidural, la duración del parto y los resultados maternos y fetales.

Cada uno de estos artículos contribuye al análisis y comprensión integral de cómo la hidroterapia impacta tanto en la experiencia del parto como en los resultados maternos y neonatales. Esta estructura permite demostrar cómo cada objetivo específico ha sido abordado y los hallazgos relevantes derivados de la investigación.

# *RESULTADOS Y DISCUSIÓN*

# *Artículo 1:*

Mellado-García E, Díaz-Rodríguez L, Cortés-Martín J, Sánchez-García JC, Piqueras-Sola B, Macías JCH, Rivas Ruiz F, Rodríguez-Blanque R. Comparative Analysis of Therapeutic Showers and Bathtubs for Pain Management and Labor Outcomes—A Retrospective Cohort Study. *Journal of Clinical Medicine*. 2024; 13(12):3517. https://doi.org/10.3390/jcm13123517

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# Comparative Analysis of Therapeutic Showers and Bathtubs for Pain Management and Labor Outcomes—A Retrospective Cohort Study

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**Abstract:** Hydrotherapy, including the use of therapeutic showers and bathtubs, has been studied for its potential benefits in labor pain management. Previous research has indicated that hydrotherapy can alleviate pain, but comparative studies between therapeutic showers and bathtubs are scarce. **Objective**: This study aims to compare the effects of therapeutic showers and bathtubs on pain perception, labor duration, use of epidural analgesia, and maternal and neonatal outcomes during labor. **Methods**: A total of 124 pregnant women were included in this study. Participants were divided into two groups: those who used a therapeutic shower and those who used a bathtub during labor. Pain levels were measured using a visual analog scale (VAS). Labor duration, use of epidural analgesia, types of delivery, maternal outcomes (postpartum hemorrhage, perineal status, maternal hypotension, fever, and breastfeeding), and neonatal outcomes (APGAR scores, fetal heart rate, complications, and neonatal unit admissions) were recorded and analyzed. **Results**: Both the therapeutic shower and the bathtub effectively reduced pain perception, with the bathtub showing a greater reduction in VAS scores. The therapeutic shower group experienced a significantly shorter labor duration compared to the bathtub group. The majority of participants in both groups did not require epidural analgesia, with no significant differences between the groups. There were no significant differences in the types of delivery. Maternal outcomes indicated a lower incidence of perineal tears and episiotomies in the therapeutic shower group. Neonatal outcomes, including APGAR scores and fetal heart rate, were similar between the groups, with no significant differences in complications or neonatal unit admissions. **Conclusions**: Both therapeutic showers and bathtubs are effective for pain relief during labor, with the bathtub showing a higher reduction in pain intensity. The therapeutic shower is associated with a shorter labor duration and a lower incidence of perineal tears and episiotomies. Both methods are safe for neonatal well-being, making hydrotherapy a viable non-pharmacological option for pain management in labor. However, the therapeutic shower may offer additional benefits in terms of labor duration and maternal outcomes.

**Keywords:** hydrotherapy; waterbirth; immersion; first labor stage; maternal health



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## 1. Introduction

Hydrotherapy as a method for managing pain during childbirth has been used for thousands of years, and its exact origin is unknown [1]. Currently, many women seek non-pharmacological methods for pain relief during labor. The use of hydrotherapy can

provide natural pain relief because warm water helps relax muscles and can reduce the sensation of pain, allowing women to better manage contractions [1,2].

The use of warm water can help reduce anxiety and stress, promoting a state of calm that facilitates the birthing process. The option to choose hydrotherapy for pain management during labor can give women a sense of control and empowerment over their birthing experience [3]. It allows them to actively participate in their care and make informed decisions about pain management. It is important to consider that each woman has her own preferences and needs during labor, and the decision to use hydrotherapy should be individualized [4].

In 2022, the Health Technology Assessment Service of the Basque Country (OSTEBA), supported by the Spanish Ministry of Health, published a comprehensive report on water immersion during labor. This study focused on two main aspects: evaluating the efficacy, effectiveness, and safety of water immersion during labor, and understanding the values and preferences of women who had experienced this birthing method. Given existing concerns, particularly regarding the safety of the newborn, the report aimed to analyze the available evidence to determine the safety and efficacy of water immersion during labor for both the mother and the neonate [5].

According to the literature review, various studies have been conducted to demonstrate the efficacy of therapeutic showers during labor for pain relief, compared to women who do not use water during the birthing process [6,7]. However, as of our review, we have not found specific studies that directly compare therapeutic showers and bathtubs in this context. Nevertheless, there are articles that compare therapeutic showers with other non-pharmacological methods, such as the use of perineal exercises with a Swiss ball during the dilation phase. These studies have yielded equally interesting results, demonstrating that the combination of therapeutic showers with these exercises is associated with reduced pain during labor and greater comfort for the mother [8].

In a pretest-posttest design study with a single group of 24 women who used the therapeutic shower for 30 min, numerical pain rating scales were evaluated before and after use. A significant decrease in both pain perception and levels of tension and anxiety was observed after the intervention [9].

Currently, in Spain, maternity units are incorporating bathtubs in their delivery rooms, but not all hospitals in the country can offer these services due to a lack of necessary infrastructure, specifically bathtubs for water immersion use by pregnant women during labor. Some delivery rooms have therapeutic showers available, but these do not provide full water immersion. The purpose of the present study was to compare whether therapeutic showers can be as effective as bathtubs regarding labor duration, use of analgesia, pain relief, and maternal and fetal outcomes.

*Objectives*

To evaluate and compare the effects of using a bathtub and a therapeutic shower during labor on pain perception, the use of epidural analgesia, labor duration, and maternal and fetal outcomes.

## 2. Materials and Methods

### *2.1. Study Design*

This is a retrospective cohort study of women who chose to use hydrotherapy during their labor. The report of this research follows the STROBE guidelines for observational studies. The study was conducted in accordance with the Declaration of Helsinki for research involving humans and was approved by the Ethics Committee of Hospital Costa del Sol (002_oct18_PI-hydrotherapy in labor) in November 2018.

### *2.2. Setting*

These are secondary outcomes from a study that evaluated the use of hydrotherapy during labor. The initial study included women who gave birth at Hospital Costa del Sol,

Málaga (Spain), during the period between January 2010, when hydrotherapy began to be offered during labor at the hospital, and December 2020. In this hospital, the use of hydrotherapy is indicated in the first stage of labor, either through a therapeutic shower or by immersion in a bathtub. Data were collected from each woman's partogram as well as from the medical records of both the mother and the newborn.

### 2.3. Participants

Our study included women with low-risk pregnancies and labors, which means they had a healthy singleton pregnancy, a body mass index of 30 kg/m$^2$ or less, cephalic presentation, spontaneous onset of labor, a gestational age between 37 + 0 and 41 + 6 weeks, and a normal cardiotocographic record upon admission. Women with multiple pregnancies and those who gave birth before 37 weeks or after 42 weeks were excluded. According to the protocol of our Labor Unit, all admitted women were offered the option to use hydrotherapy during the labor process. The participants in this study had no history of opioid medication use.

### 2.4. Variables and Data Sources

The study meticulously planned data coding in advance, extracting data directly from medical records into a structured database. It analyzes a variety of variables related to labor and hydrotherapy. Regarding pain relief during labor, pain perception was assessed using the visual analogue scale (VAS) in both the therapeutic shower group and the bathtub group, as well as comparing the median pain scores before and after the use of each method. Regarding labor duration, dilation times and overall labor time were examined in both groups. The use of epidural analgesia during labor was also recorded. In terms of delivery types, the proportion of spontaneous and operative deliveries in each group was observed. Additionally, various maternal outcomes were explored, including the incidence of postpartum hemorrhage, perineal status, presence of hypotension, maternal fever, and breastfeeding. As for neonatal outcomes, APGAR scores, fetal heart rate, fetal complications, and neonatal unit admission were analyzed.

### 2.5. Bias

To mitigate potential biases, the study established precise inclusion and exclusion criteria for participants, ensured data anonymity, and conducted meticulous data coding. Additionally, confounding variables were controlled through multivariable statistical analysis. These measures ensured the validity and reliability of the findings obtained in this retrospective cohort study.

### 2.6. Study Size

The sample size for this study was determined using the same parameters and methodology as the previously published initial study [10]. For the primary objective of comparing the duration of the first stage of labor between the hydrotherapy group and the non-hydrotherapy group, a statistically significant difference of 16 min between the groups was considered. Based on the study by Torkamani, Kangani, and Janani (2010) [11], a standard deviation of 48 min was used for each group. With a type I error (alpha) of 0.05 and a type II error (beta) of 0.20, it was determined that 111 patients per group were required. Considering a 10% loss rate in the evaluation of medical records, the total sample size was adjusted to 248 patients, evenly distributed as 124 patients per group.

To ensure the robustness of the results and to study additional data of interest, the sample was expanded to a total of 377 women, with 253 individuals in the control group and 124 in the hydrotherapy experimental group. This approach allowed us to further explore various relevant clinical and demographic aspects while maintaining consistency with the originally calculated sample size from the initial study.

### 2.7. Statistical Methods

Descriptive analysis was performed using measures of central tendency, dispersion, and position (median and interquartile range (P75–P25)) for quantitative variables and frequency distribution for qualitative variables. To assess differences between study groups (bath vs. shower), the chi-squared test (or Fisher's exact test if expected frequencies were less than 5) was used for qualitative variables, while Student's *t*-test (or Mann–Whitney U test if the distribution was non-normal) was used for quantitative variables. Using pain as the outcome variable, a multivariate linear regression model was employed, including unbalanced independent variables from previous bivariate analysis, selecting variables with a criterion of $p < 0.05$, and describing the Beta coefficient (β) with respective 95% confidence intervals (CI95%). This involved checking for normality, homoscedasticity, and multicollinearity.

For all analyses, the level of statistical significance was set at $p < 0.05$. The analysis was performed using SPSS vs. 28.0 program for Windows (IBM Corporation, Armonk, NY, USA) statistical software.

### 2.8. Ethics Statement

This study was conducted in accordance with the Declaration of Helsinki for research involving human subjects. The Ethics Committee of the Costa del Sol Hospital approved the study in November 2018 under reference number 002_oct18_PI-hydrotherapy birth, ensuring the ethical compliance of the research.

No personal or identifying information was collected. Anonymity was guaranteed by the research service of Hospital Costa del Sol, which anonymized the personal or identifying data of the women involved in the study. Additionally, the data were stored on a password-protected personal computer.

## 3. Results

The results examined the effect of hydrotherapy, both in the form of a bathtub and a therapeutic shower, in relation to pain relief during labor, its duration, the use of pharmacological analgesia, and delivery types. Additionally, maternal and fetal outcomes were analyzed based on whether water immersion in a bathtub or the use of water in a therapeutic shower was performed.

For this study, a sample of 124 laboring women was recruited using a systematic sampling approach. This included 44 women (35.5%) who utilized the therapeutic shower and 80 women (64.5%) who immersed themselves in a bathtub with water immersion (Figure 1).

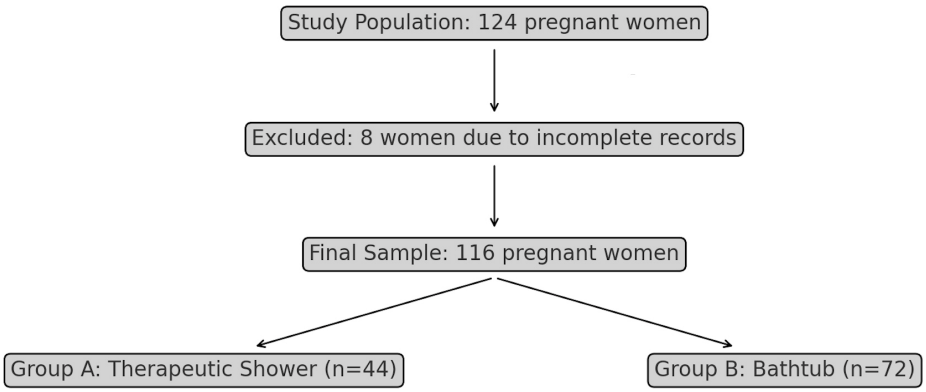


**Figure 1.** Flow diagram.

To determine if there were significant differences between the groups, the obstetric characteristics of the sample were evaluated, which are presented in Table 1:

**Table 1.** Baseline characteristics of the sample.

| Variables | | Therapeutic Shower | Bathtub | Total | *p*-Value |
|---|---|---|---|---|---|
| Age; Mean ± SD | | 30.70 ± 5.083 | 32.25 ± 5.784 | | 0.140 |
| Gestation grouped; *n* (%) | 1 | 19 (43.2%) | 43 (53.8%) | 62 (50%) | 0.549 |
| | 2 | 17 (38.6%) | 21 (26.3%) | 38 (30.6%) | |
| | 3 or more | 8 (18.2%) | 16 (20%) | 24 (19.4%) | |
| Abortions; *n* (%) | Absence | 36 (81.8%) | 59 (73.8%) | 95 (76.6%) | 0.427 |
| | Presence | 8 (18.2%) | 21 (26.3%) | 29 (23.4%) | |
| Previous Children | 0 | 23 (52.3%) | 54 (67.5%) | 77 (62.1%) | 0.139 |
| | 1 or more | 21 (47.7%) | 26 (32.5%) | 47 (37.9%) | |

These results demonstrate the distribution of key obstetric characteristics between women who used a therapeutic shower and those who used a bathtub during labor. No statistically significant differences were found between the groups in terms of age, grouped gestation, history of abortions, or the number of previous children.

As shown in Table 2, the primary and secondary outcomes of our study indicate significant differences in the total labor time and intact perineal state between the groups using the therapeutic shower and the bathtub. However, no significant differences were found in the use of epidural analgesia, types of delivery, or the incidence of maternal fever and breastfeeding.

**Table 2.** Summary of Primary and Secondary Outcomes.

| Outcomes | Therapeutic Shower Group | Bathtub Group | *p*-Value |
|---|---|---|---|
| Primary Outcomes | | | |
| Total labor time (minutes) | 155 (96.25–242.5) | 227.5 (141.25–403.75) | 0.004 |
| Use of epidural analgesia | 7 (15.9%) | 18 (22.5%) | 0.521 |
| Types of delivery (% spontaneous) | 97.7% | 97.5% | >0.05 |
| Pain perception before (VAS) | 8 (7–9) | 7 (7–8) | - |
| Pain perception after (VAS) | 7.5 (6.25–8.75) | 5 (4–7) | - |
| Secondary Outcomes | | | |
| Postpartum hemorrhage | 2 (4.5%) | 4 (5.0%) | >0.05 |
| Intact perineal state | 45.5% | 23.8% | 0.022 |
| Maternal hypotension | 9.1% | 3.8% | 0.244 |
| Maternal fever | 0% | 1 (1.3%) | >0.05 |
| Breastfeeding | 95.5% | 96.3% | 1.000 |
| APGAR score at 1 min (median, IQR) | Not specified | Not specified | Not specified |
| APGAR score at 5 min (median, IQR) | Not specified | Not specified | Not specified |
| Fetal heart rate | No specified complications | No specified complications | >0.05 |

### *3.1. Pain Relief*

The initial findings of this study revealed statistically significant differences between the use of hydrotherapy during labor compared to non-use, regardless of whether a therapeutic shower or bathtub was utilized during labor [10]. At this juncture, we scrutinized the sensation of pain in the bathtub versus the therapeutic shower.

Our sample, comprised of 124 pregnant women, furnishes comparative data on perceived pain during the use of therapeutic showers and bathtubs. In the therapeutic shower group, eight cases were lost, while in the bathtub group, five cases were lost due to lack of recording.

According to the results presented, both the use of therapeutic showers and bathtubs show a reduction in pain perception compared to the sensation of pain prior to their use. However, this decrease is more pronounced in the bathtub group, with the difference in the pain perception scale before and after use being statistically significant ($p = 0.003$). In

contrast, in the therapeutic shower group, although there is a noticeable reduction in pain perception, this difference does not reach statistical significance ($p = 0.083$) (Figures 2 and 3).

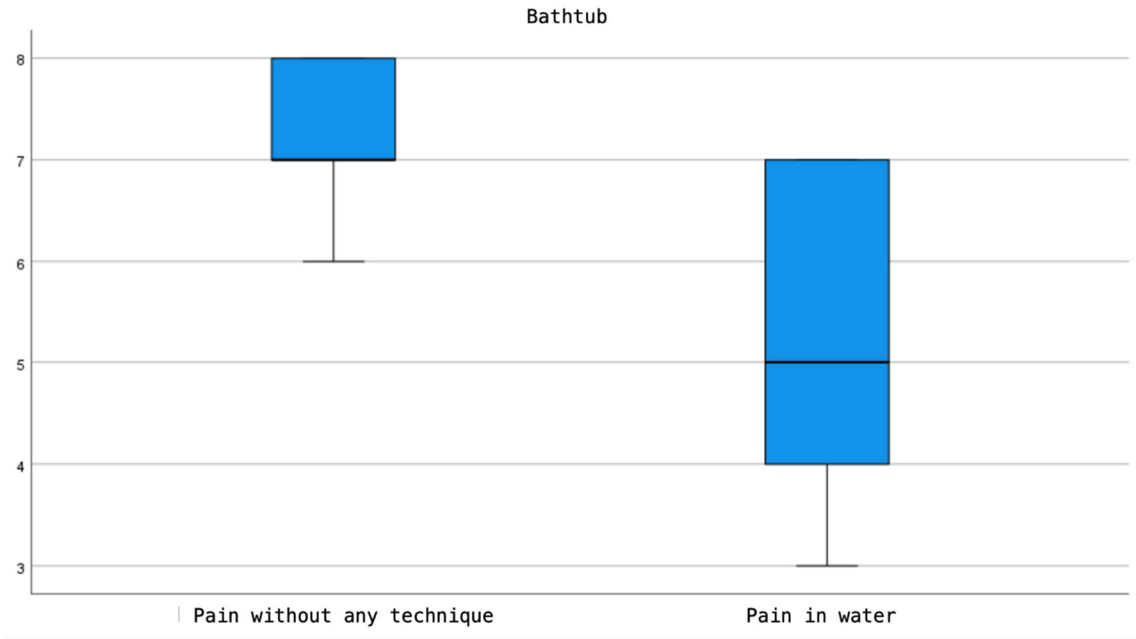


**Figure 2.** Comparison of Pain Intensity in the Bathtub, Before and After Use.

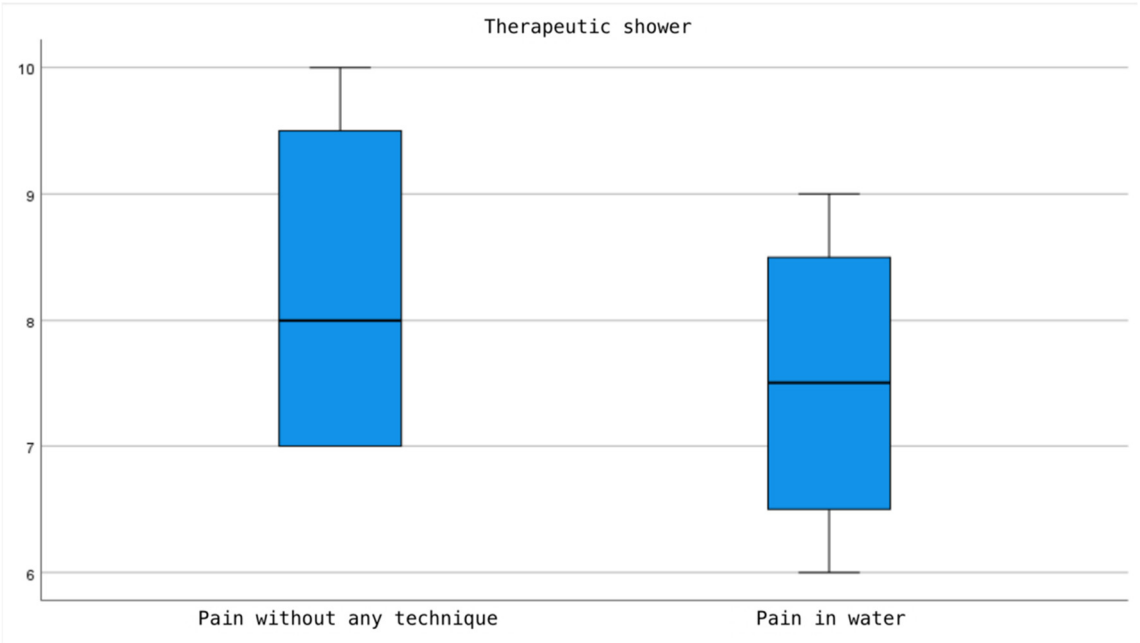


**Figure 3.** Comparison of Pain Intensity in the Therapeutic Shower, Before and After Use.

### *3.2. Duration of Labor*

Upon examining the results between the group using the therapeutic shower and the group using the bathtub, it was found that dilation times and overall labor duration showed significant differences between the two groups, favoring the group that used the therapeutic shower (Table 3).

**Table 3.** Results of Labor Duration by Stages in the Use of Bathtub and Therapeutic Shower.

| Therapeutic Shower vs. Bathtub | | | Dilation Time | Expulsive Time | Placental Expulsion Time | Total Labor Time |
|---|---|---|---|---|---|---|
| Therapeutic shower | *n* | Valid | 44 | 44 | 44 | 44 |
| | | Missing | 0 | 0 | 0 | 0 |
| | Median | | 90 | 31 | 10 | 155 |
| | Percentile | 25 | 56.25 | 16.25 | 10 | 96.25 |
| | | 75 | 133.75 | 53.75 | 16.75 | 242.5 |
| Bathtub | *n* | Valid | 80 | 80 | 80 | 80 |
| | | Missing | 0 | 0 | 0 | 0 |
| | Median | | 150 | 44 | 10 | 227.5 |
| | Percentile | 25 | 93.75 | 15 | 10 | 141.25 |
| | | 75 | 240 | 90 | 15 | 403.75 |
| *p* valor | | | 0.002 | 0.167 | 0.865 | 0.004 |

### 3.3. Use of Analgesia

A total of 99 pregnant women did not use epidural analgesia, representing 79.8% of the 124 women in our study. The comparison between groups yielded a non-significant result, indicating no association between epidural use and the bathing method, whether therapeutic shower or bathtub.

### 3.4. Types of Delivery

The data comparing the therapeutic shower group and the bathtub group, as well as the types of delivery, are very similar. According to the *p*-values obtained, none of the statistical tests performed indicate a statistically significant association between the type of delivery and the bathing method. All *p*-values are well above the 0.05 threshold. Therefore, no significant differences were found between the use of the bathtub and the therapeutic shower concerning the types of delivery. The analysis indicates that in the therapeutic shower group, 2.3% of deliveries were operative vaginal and operative cesarean, while 97.7% were spontaneous vaginal. In the bathtub group, 2.5% of deliveries were operative vaginal and operative cesarean, and 97.5% were spontaneous vaginal.

### 3.5. Maternal Outcomes

The effect of the therapeutic shower and bathtub on various maternal parameters has been investigated:

#### 3.5.1. Postpartum Hemorrhage

There were two cases of postpartum hemorrhage in the therapeutic shower group and four cases in the bathtub group, representing 4.5% and 5.0% of the sample, respectively. However, no statistically significant differences were found regarding this variable.

#### 3.5.2. Postpartum Perineal Status

The study results indicate a statistically significant decrease in the frequency of 1st, 2nd, and 3rd-degree tears, as well as episiotomies, in favor of the group that used the therapeutic shower. In the therapeutic shower group, 45.5% of women had an intact perineum after delivery, compared to 23.8% in the bathtub group. The incidence of 1st, 2nd, and 3rd-degree tears and episiotomies was 54.5% and 76.3%, respectively. The *p*-value of 0.022 suggests that the use of the therapeutic shower was associated with a lower incidence of tears and episiotomies compared to the use of the bathtub.

#### 3.5.3. Maternal Hypotension

It was observed that 9.1% of women in the therapeutic shower group experienced hypotension, compared to 3.8% of women who used the bathtub. However, the *p*-value of 0.244 does not show statistically significant differences between the groups.

#### 3.5.4. Maternal Fever

In the therapeutic shower group, no cases of fever were recorded, while in the bathtub group, there was one case with a fever above 38 °C. No significant differences were found between the groups concerning this variable.

#### 3.5.5. Breastfeeding

No statistically significant differences were recorded ($p$ = 1.000); both percentages were high, with 95.5% for women who used the therapeutic shower compared to 96.3% for those who used the bathtub.

### *3.6. Neonatal Outcomes*

Regarding fetal parameters, the analysis between the groups revealed no significant differences in APGAR scores at 1 and 5 min, except for one case in the bathtub group with an APGAR score at 1 min below 7. Fetal heart rate (FHR) was normal in 94.4% of cases in both groups. Specifically, in the therapeutic shower group, 6.8% had a non-reassuring fetal cardiotocographic record (FCTG), while in the bathtub group, this percentage was 5%. No significant differences were found in the APGAR and FCTG variables.

Regarding fetal complications and neonatal unit admissions (NICU), 119 newborns did not have complications, and 118 did not require NICU admission, representing 96% and 95.2% of the sample, respectively. Fetal complications occurred in 5% of the newborns in the bathtub group and 2.3% of the newborns in the therapeutic shower group. NICU admission occurred in 5% of the newborns in the bathtub group and 4.5% of the newborns in the therapeutic shower group. No significant differences were found for these two variables, thus no relationship could be established between the method of water use during labor and the presence of fetal complications or NICU admissions.

## 4. Discussion

We focused on investigating the effect of hydrotherapy during labor, according to the use of a bathtub or therapeutic shower, in relation to perceived pain, labor duration, analgesia use, and maternal and neonatal outcomes. The objective is to contribute to the scientific evidence by comparing these two groups, which is uncommon due to the scarcity of literature addressing this comparison.

Pain management is a fundamental aspect of labor care, which is why it has been the subject of numerous scientific investigations studying its relationship with non-pharmacological methods such as hydrotherapy. Publications analyzing both the therapeutic shower and the bathtub encompassed in hydrotherapy in general emphasize how the sensation of pain can decrease through the use of hydrotherapy. Our study also corroborates these findings: the comparison between the groups shows that the bathtub reduces the sensation of pain by one point more on the visual analog scale (VAS) compared to the therapeutic shower. Other studies, such as the one conducted by Davim et al. [12], have observed that pain relief increases as dilation progresses during labor when using the therapeutic shower. In a clinical trial conducted by Lee et al. [6], it was demonstrated that the therapeutic shower is a cost-effective, comfortable, and easy-to-perform non-pharmacological method for reducing pain, with positive results on a visual analog pain scale. A systematic review by Vargens, Silva, and Progianti [3] compiled 21 articles on the use of hydrotherapy and concluded that both the bathtub and the therapeutic shower effectively reduce pain during labor.

Our study also shows that the therapeutic shower results in a shorter labor duration compared to the use of the bathtub. Numerous studies discuss the use of the bathtub as a pain relief method [13–17], while there are also studies addressing the use of the therapeutic shower [6,7,12,13,18]. A decrease in dilation time and total labor duration has been observed when using the therapeutic shower as a method. Gallo et al. [13] detailed in their randomized trial how a warm shower at more than 7 cm dilation, combined with exercises on a Swiss ball and lumbosacral massage before 7 cm, yielded significant benefits,

such as a reduction of 72 min compared to the group that did not use non-pharmacological techniques during labor, as well as differences in faster expulsion times.

Regarding specific research on analgesia use, the systematic review by Cluett et al. [1] revealed discrepancies in the use of epidural analgesia among women who opted for water immersion during the first stage of labor and those who did not. It was observed that in the group of women who experienced water labor, a smaller proportion opted for epidural analgesia compared to the groups that did not use water as a pain relief method. However, no significant differences were found in the use of epidural analgesia or the use of pethidine/narcotics between the different groups. In our study, we found a significant association between the use of epidural and the use of hydrotherapy, either in a bathtub or therapeutic shower, considering that the majority of pregnant women who used the therapeutic shower or bathtub did not use epidural analgesia. Authors like Gallo et al. [13] and Stark [7] describe the therapeutic shower as one of the beneficial non-pharmacological interventions, with few side effects or contraindications, allowing for a reduction in pain perception and even reducing the use of epidural analgesia, although Stark's study [7] found similar use of epidural analgesia in both the therapeutic shower group and the control group.

The randomized trial by Gallo et al. [13] not only studied variables such as pain and labor duration in women who used the therapeutic shower but also examined other parameters similar to those measured in our study. However, it is important to note that Gallo et al.'s study compared the use of the therapeutic shower with exercises on a Swiss ball and lumbosacral massage. Among the results, neonatal effects stood out: the experimental group had a lower risk of respiratory distress and significantly better Apgar scores. However, no significant differences were observed regarding delivery types, perineal status, or obstetric complications. In our study, we also evaluated these parameters and found no significant differences, except in postpartum perineal status, where we observed a decrease in the frequency of tears and episiotomies in the group that used the therapeutic shower.

The main limitation was the lack of exhaustive records in medical histories, leading to a sample of sixteen pregnant women, as previous information was not typically recorded in these histories. Another limitation was the absence of data related to the water temperature of the bathtub or therapeutic shower, information that would have been useful to assess its possible impact on the health of pregnant women and fetal development. Water temperature could influence various physiological factors, such as blood circulation and muscle relaxation, in addition to preventing risks associated with extreme temperatures, such as overheating or thermal shock. Additionally, the retrospective nature of the study conducted at a single institution is a significant limitation, predisposing the results to considerable bias. This characteristic prevents the generalization of the findings to other populations or contexts.

## 5. Conclusions

The study demonstrates that hydrotherapy, through the use of both bathtubs and therapeutic showers, effectively reduces pain perception during labor. The bathtub, in particular, provides a slightly higher pain relief compared to the therapeutic shower. Moreover, the therapeutic shower is associated with a shorter labor duration. Despite these benefits, it is important to acknowledge the limitations, such as the retrospective nature of the study conducted at a single institution, which may introduce significant bias and limit the generalizability of the results. Further research with larger, multicenter studies is needed to validate these findings.

**Author Contributions:** Conceptualization, R.R.-B., J.C.-M., E.M.-G. and J.C.S.-G.; data curation, J.C.-M., L.D.-R., J.C.S.-G. and J.C.H.M.; formal analysis, F.R.R. and J.C.S.-G.; investigation, R.R.-B., L.D.-R., E.M.-G. and J.C.S.-G.; methodology, F.R.R., E.M.-G., R.R.-B. and L.D.-R.; project administration, R.R.-B., B.P.-S., J.C.-M. and J.C.S.-G.; resources, E.M.-G., J.C.S.-G., R.R.-B. and L.D.-R.; supervision, L.D.-R. and R.R.-B.; validation, R.R.-B., J.C.-M., L.D.-R., B.P.-S. and E.M.-G.; visualization,

R.R.-B., J.C.-M. and L.D.-R.; writing—original draft preparation, J.C.-M., R.R.-B., E.M.-G. and J.C.S.-G.; writing—review and editing, R.R.-B., J.C.-M., B.P.-S., E.M.-G., L.D.-R. and J.C.S.-G. All authors have read and agreed to the published version of the manuscript.

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**Institutional Review Board Statement:** The Ethics Committee of the Hospital Costa del Sol approved this study in November 2018 under reference number 002_oct18_PI-hydrotherapy birth, thus ensuring the ethical compliance of the research in question.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Data regarding this study are available upon request from the corresponding author.

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# *Artículo 2:*

Mellado-García E, Díaz-Rodríguez L, Cortés-Martín J, Sánchez-García JC, Piqueras-Sola B, Higuero Macías JC, Rodríguez-Blanque R. Effects of Hydrotherapy on the Management of Childbirth and Its Outcomes—A Retrospective Cohort Study. *Nursing Reports*. 2024; 14(2):1251-1259. https://doi.org/10.3390/nursrep14020095

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# Effects of Hydrotherapy on the Management of Childbirth and its Outcomes—A Retrospective Cohort Study

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**Abstract:** The use of hydrotherapy during childbirth has gained relevance due to the demand for natural childbirth and greater respect for the woman's choice. Studies have shown benefits such as less use of epidural analgesia, increased ability to cope with pain, shorter labor, and a better overall birth experience. Objective: The main objective of this study was to generate further evidence on maternal and birth outcomes associated with the use of hydrotherapy during labor, specifically aiming to describe the effects of water immersion during all stages of labor (first, second, and third) on women. Methodology: A retrospective cohort study was carried out on a random sample of women who gave birth at the Costa del Sol Hospital between January 2010 and December 2020. The calculated sample size was 377 women and the data were extracted from their partograms. After data extraction, two groups were formed: one group used hydrotherapy during childbirth ($n$ = 124), while the other group included women who did not use hydrotherapy during the childbirth process ($n$ = 253). Results: The results highlight significant differences in pain perception, analgesia use, types of labor, and delivery times between the two groups. Women who did not use hydrotherapy reported higher pain perception, with a median (IQR) of 8 (7–9) on a numerical scale, compared to a median (IQR) of 6 (5–7) for the hydrotherapy group. Furthermore, the group without hydrotherapy required epidural analgesia in 40% of cases, while in the hydrotherapy group, it was only necessary in 20%. In terms of the type of delivery, the hydrotherapy group had more spontaneous vaginal deliveries compared to the non-hydrotherapy group, which had more operative vaginal deliveries. The overall duration of labor was longer in the hydrotherapy group, especially in women who arrived at the hospital late in labor. Conclusions: Hydrotherapy is associated with a longer time to delivery. Women with a higher pain tolerance tend to opt for hydrotherapy instead of epidural analgesia.

**Keywords:** hydrotherapy; waterbirth; immersion; first labor stage; maternal health



**Citation:** Mellado-García, E.; Díaz-Rodríguez, L.; Cortés-Martín, J.; Sánchez-García, J.C.; Piqueras-Sola, B.; Higuero Macías, J.C.; Rodríguez-Blanque, R. Effects of Hydrotherapy on the Management of Childbirth and its Outcomes—A Retrospective Cohort Study. *Nurs. Rep.* **2024**, *14*, 1251–1259. https://doi.org/10.3390/nursrep14020095

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## 1. Introduction

Medical procedures and care during childbirth are more popular than ever. It is necessary to personalize the care and resources available for childbirth, considering the pain, situation, and individual desires of each woman. Among the available non-pharmacological resources is hydrotherapy, which can be combined with relaxation and psychological techniques.

Hydrotherapy during childbirth offers benefits such as buoyancy and temperature regulation, supported by studies [1–5]. It is a mother-centered method for pregnancy and childbirth, providing comfort and utility [6]. Additionally, hydrotherapy improves the ability to have a natural and physiological birth, enhancing the overall childbirth experience [5].

Among the effects of hydrotherapy are a reduction in the use of epidural analgesia [4,7–11]; an improvement in the ability to cope with pain [3,7,12]; shorter labor [8,10,11,13,14]; an increased sense of control, according to some authors' studies [1,15]; and positive effects on maternal [4] and neonatal [16] health. The Clinical Practice Guideline on Normal Childbirth Care in Spain [17] recommends immersion in hot water as an effective method for relieving pain during the final stage of childbirth.

The main objective of this study was to evaluate the effect of hydrotherapy during childbirth, specifically on delivery times.

## 2. Materials and Methods

### *2.1. Study Design*

This was a retrospective cohort study of women who elected to receive hydrotherapy during their labor. The report of this research adheres to STROBE reporting guidelines for observational research [18].

### *2.2. Setting*

Women who gave birth at the Costa del Sol Hospital, Málaga (Spain) during the period from January 2010, when the use of hydrotherapy during childbirth began to be offered at the hospital, to December 2020 were included in the study. In this hospital, the use of hydrotherapy is indicated for use in the first stage of labor. Exceptionally, if the woman refuses to leave the water and proceeds to the second stage of labor in water, her decision is respected, but this is not the hospital's offering nor the objective of this study.

The data were collected from the partogram of each woman, as well as from the medical records of both the woman and the newborn.

### *2.3. Participants*

In our study, we included women with a low-risk pregnancy and birth, meaning those with a healthy singleton pregnancy, a body mass index $\leq 30$ kg/m$^2$, cephalic presentation, spontaneous onset of labor, a gestational age between 37 + 0 and 41 + 6 weeks, and a normal cardiotocographic registry at admission. Women with twin pregnancies were excluded, as well as those with pre-term (<37 weeks) or post-term (>42 weeks) delivery.

Per protocol of our Birthing Unit, all women admitted to the unit are offered the possibility of using hydrotherapy during the delivery process.

### *2.4. Variables and Data Sources*

The study meticulously planned data encoding in advance, directly extracting from medical records into a structured database. Sociodemographic and anthropometric variables, alongside the utilization of hydrotherapy during labor, were partitioned into two distinct tables for analysis. The principal variables encompassed age, parity, and labor duration, sourced from both clinical history records and the partograms. Additional recorded variables encompassed the type and onset of labor, analgesia and oxytocin administration, labor pain, and occurrences such as membrane rupture and the third stage of labor being recorded.

### *2.5. Bias*

The study addressed biases by establishing clear inclusion and exclusion criteria for its participants, ensuring data anonymity, and conducting meticulous data encoding. Additionally, confounding variables were controlled through multivariable statistical analysis. These measures ensured the validity and reliability of the findings obtained in this retrospective cohort study.

### *2.6. Study Size*

Referring to the systematic review by Cluett et al. [19], for the primary objective of this study, i.e., to compare the durations of their first stage of labor, a time less than

16 min between the hydrotherapy group and the non-hydrotherapy group was considered statistically relevant. For a known standard deviation of 48 min for each group (referring to the 2010 Torkamani, Kangani, and Janani study [20]), a type I error (alpha) of 0.05, and a type II error (beta) of 0.20, 111 patients were required per group. Estimating a loss of 10% in the evaluation of medical records, the total number of patients to be evaluated was 248 (124 patients per group).

The calculated sample size for this study was 248 pregnant women, including a control group of 124 women and 124 women in the hydrotherapy group.

To reach a sample size of 124 women in the hydrotherapy group, the sample was expanded to a total of 377 women, distributed among 253 individuals in the control group and 124 in the experimental hydrotherapy group.

### *2.7. Statistical Methods*

Descriptive analyses were conducted using measures of the central tendency and dispersion (mean and standard deviation) for quantitative variables, and the frequency distribution for qualitative variables. To evaluate differences between the study groups (no hydrotherapy use vs. use of hydrotherapy), the chi-square test (or Fisher's exact test in case of expected frequencies less than 5) was used for the categorical variables, and the Student's *t*-test was used for the quantitative variables. Using pain as the outcome variable, a multivariate linear regression model was employed, including unbalanced independent variables from the previous bivariate analysis, selecting variables with a criterion of $p < 0.05$, and describing the beta coefficient (β) with respective 95% confidence intervals (CI95%). This involved checking for normality, homoscedasticity, and multicollinearity.

For all analyses, the level of statistical significance was set at $p < 0.05$. These analyses were performed using SPSS vs. 28.0 program for Windows (IBM Corporation, Armonk, NY, USA) statistical software.

### *2.8. Ethics Statement*

This study was conducted in accordance with the Declaration of Helsinki for research involving human subjects. The Ethics Committee of the Costa del Sol Hospital approved this study in November 2018 under reference number 002_oct18_PI-hydrotherapy birth, thus ensuring the ethical compliance of the research in question.

No personal or identifying information was collected. Anonymity was guaranteed thanks to the research service of the Costa del Sol Hospital, which anonymized the personal or identifying data of the women involved in the study. In addition, the data were stored in a password-protected personal computer.

## 3. Results

Data were collected from a total of 377 women ($n$ = 253 for those who did not use hydrotherapy; $n$ = 124 for those who used water during labor). There were no statistically significant differences in their age ($p$ = 0.103; non-hydrotherapy group: 32.4 ± 5.3 years, and hydrotherapy group: 31.7 ± 5.6 years).

Table 1 shows the baseline characteristics of the sample.

The use of hydrotherapy is influenced by the profile of the parturient; it is observed that there are statistically significant differences between women presenting their first pregnancy and those who presented their second or third gestation onwards (chi-square of 12.153 with a significance of 0.002). Among the women who chose to use hydrotherapy, women with no previous experience in childbirth were more likely to use hydrotherapy (43.4%) than women who had had a previous birth (28.8%) and those who had had more than one previous birth (23.5%). Related to this is the number of previous children, which is significant for the women with no previous children versus those with one or more than one ($p < 0.001$).

**Table 1.** Baseline characteristics of the sample.

| | | No Hydrotherapy | | Hydrotherapy | | *p* |
|---|---|---|---|---|---|---|
| | | *n* | % | *n* | % | |
| Total | | 253 | 67.1 | 124 | 32.9 | |
| Age | Mean SD | 32.5 (5.3) | - | 31.7 (5.6) | - | 0.103 |
| Abortions | Absence | 201 | 67.9 | 95 | 32.1 | 0.62 |
| | Presence | 52 | 64.2 | 59 | 35.8 | |
| Parity | 0 | 94 | 55 | 77 | 45 | |
| | 1 | 109 | 73.2 | 40 | 26.8 | <0.001 |
| | ≥2 | 50 | 87.7 | 7 | 12.3 | |
| Initiation of Labor | Spontaneous | 208 | 63.8 | 118 | 36.2 | <0.001 |
| | Induced | 45 | 88.2 | 6 | 11.8 | |
| Newborn Weight (grams) | Mean SD | 3321.9 (446.3) | - | 3306.3 (378.8) | - | 0.369 |

The presence of previous miscarriages does not differ significantly between the groups and did not influence the women's requests for hydrotherapy or no hydrotherapy ($p = 0.6$). Conventional management of labor, which includes the use of oxytocin and artificial rupture of membranes, was occasionally employed. The hydrotherapy group exhibited lower oxytocin usage (8.9%), and concerning the artificial rupture of membranes during labor, there was more oxytocin administration in the non-hydrotherapy group (8.1%) compared to the hydrotherapy group. Thus, fewer uses of oxytocin and artificial ruptures of membranes were observed in the hydrotherapy group, with significant differences being noted between the two groups regarding oxytocin administration ($p = 0.007$).

Regarding the types of delivery, the highest percentage was concentrated in "Spontaneous vaginal delivery", accounting for 94.7% of the total women. Those who did not use hydrotherapy represented 93.3%, while those who did represented 97.6%. For "Operative vaginal delivery", it was observed that "ventouse" was used in 3.2% of women who did not use hydrotherapy, compared to 1.6% of those who did. Forceps were used for 1.2% of the women who did not use hydrotherapy, and no use of these assisted techniques was observed in the women who used hydrotherapy. Regarding "Cesarean delivery", the percentage was 2% in the women who did not use hydrotherapy, compared to 0.8% in those who did.

It is observed that hydrotherapy, with a mean of $6 \pm 1$, is associated with a lower pain perception compared to the absence of hydrotherapy, which presented a mean of $8 \pm 1$.

Many of these women opted for the use of epidural analgesia at some point during labor. The utilization of epidural analgesia in the hydrotherapy group was 20.2%, while in the non-hydrotherapy group, 40.7% of the women demanded epidural analgesia, with the difference being statistically significant ($p < 0.001$). The median duration of labor was longer for the women who utilized hydrotherapy during labor compared to those who did not (140 min vs. 180 min; $p = 0.002$), as illustrated graphically in Figure 1.

The median duration of the first stage of labor (dilation) was 105 min for the group that did not use hydrotherapy compared to 130 min for the group that used hydrotherapy ($p = 0.007$). The median duration of the second stage of labor (expulsion) was 40 min for women who used hydrotherapy and 25 min for those who did not use hydrotherapy ($p = 0.021$). Delivery times in the third stage of labor showed significant differences ($p = 0.002$), with better results for women who did not use hydrotherapy compared to those who did.

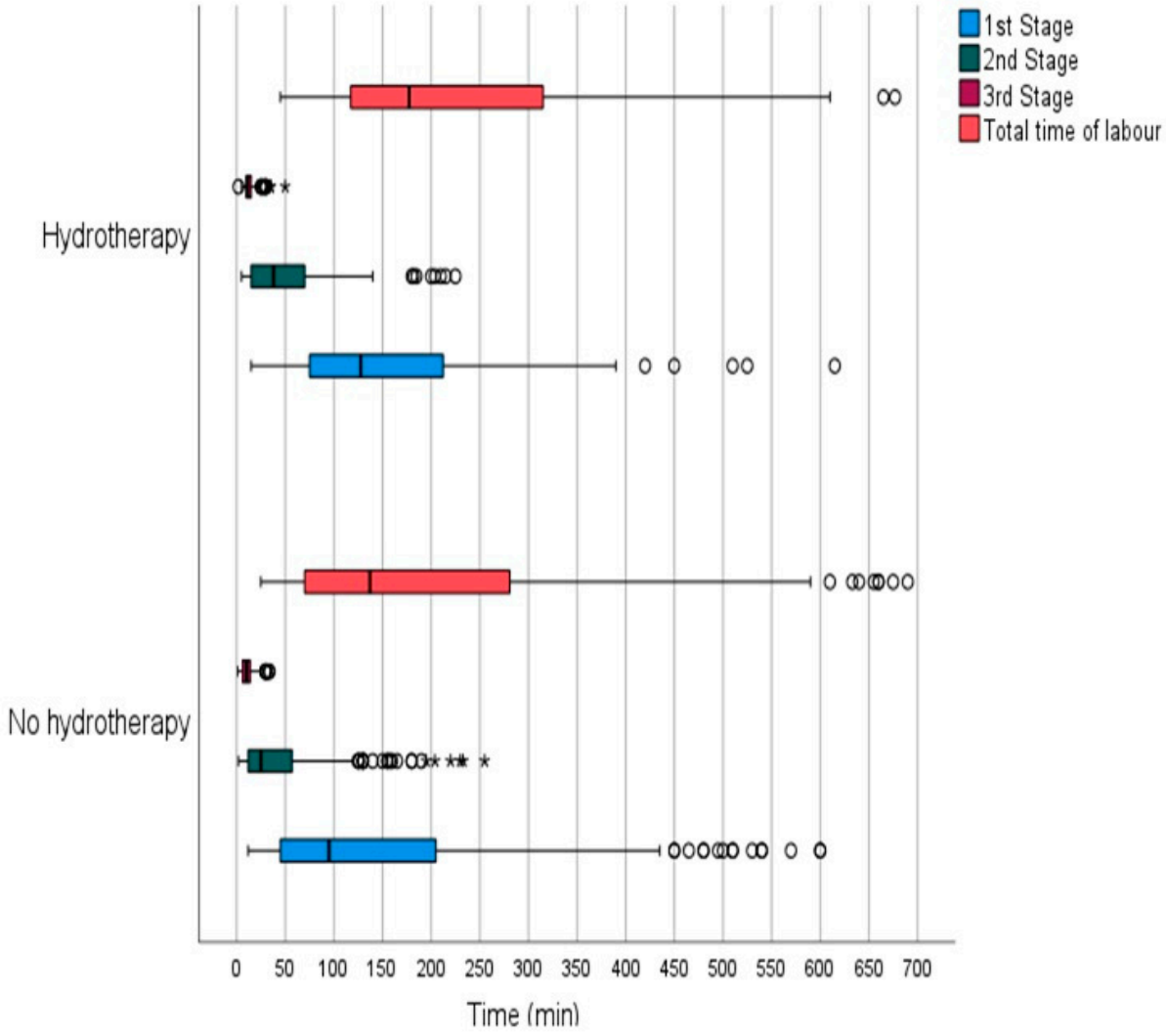


**Figure 1.** Median durations of labor considering labor stages and hydrotherapy use. Circle represents mild outlier, asterisk represents extreme outlier.

Referring to the results obtained for both the use of epidural analgesia and the delivery times, and taking into account the aforementioned results with respect to the overall delivery times, we compared the group that used analgesia and did not use hydrotherapy with the group that used analgesia and did use hydrotherapy; the differences were not significant (Figure 2).

The women in our study experienced greater pain relief during labor with the use of hydrotherapy. The differences were significant ($p < 0.001$) between the two groups: the group that did not use hydrotherapy presented a mean value of 8 on the numerical pain scale compared to a value of 6 in the group that used hydrotherapy (Figure 3).

In the multivariate linear regression model, in which the variables previous gestation, age, and use of hydrotherapy were related to pain during labor, we found that the β value indicated that the presence of hydrotherapy reduced pain by a score of 1.56 (95% CI (1.26–1.86)) compared to the non-hydrotherapy group scores, adjusted for both age and previous gestation.

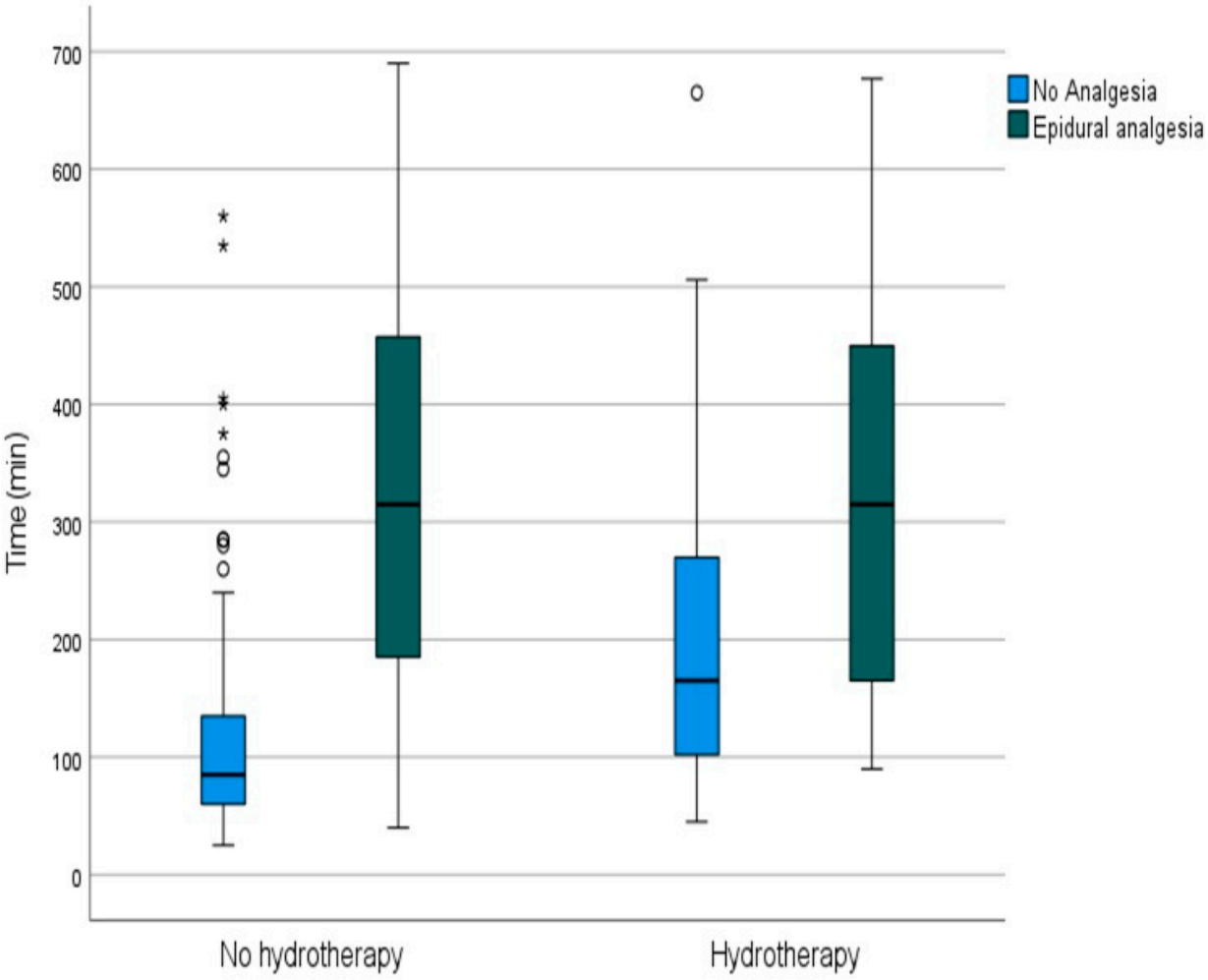


**Figure 2.** Mean durations of labor considering hydrotherapy use and analgesia use. Circle represents mild outlier, asterisk represents extreme outlier.

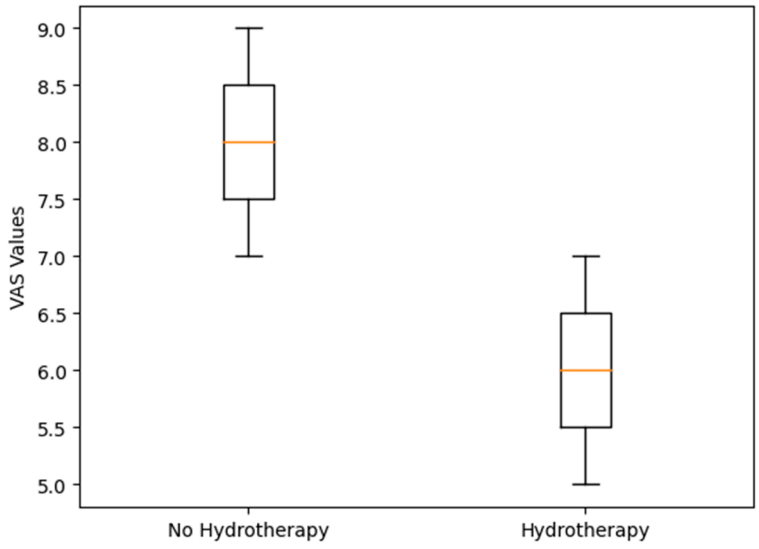


**Figure 3.** Distribution of VAS values considering the use of hydrotherapy.

## 4. Discussion

Our study revealed statistically significant differences in the duration of different stages of labor between women who used hydrotherapy and those who did not. Specifically, we observed a shorter first stage of labor among women who utilized hydrotherapy compared to those who did not ($p = 0.007$; median 130 min (IQR = 153.75 min) vs. median 105 min (IQR = 165 min)), while the duration of the second stage of labor was comparable between the two groups ($p = 0.021$; median 40 min (IQR 57.25 min) vs. median 25 min (IQR 47.5 min)). Significant differences were also found in the third stage of labor ($p < 0.000$), favoring those who did not use hydrotherapy (median 10 min (IQR 8.5 min) vs. median 10 min (IQR = 5 min)). It is noted that the disparity in labor durations may be attributed to differences in the composition of the population groups studied, especially regarding the parity of the women.

Our findings contrast with those presented in the studies by Schorn et al. [21] and Cluett et al. [22], who found no significant differences in the total duration of labor or in the duration of the first stage of labor between women who utilized hydrotherapy and those who did not. Conversely, the results of the study by Chaichian et al. [14] demonstrate significant differences in the duration of the active phases of the first and third stages of labor between groups of women who used hydrotherapy and those who did not. This is consistent with our findings, as we also observed significant differences in the duration of the first stage of labor between the two groups of women.

Our study highlights the impact of hydrotherapy on pain during labor. We found that its use was associated with less pain, with a mean score of 6 on the pain visual analog scale, compared to a mean score of 8 in women who did not use hydrotherapy ($p < 0.001$). Additionally, women who did not use hydrotherapy had a higher demand for epidural analgesia. Several studies [12,23–27] support these findings by explaining how hydrotherapy reduces stress hormones, facilitating neurohormonal interactions [28] that decrease pain perception during labor.

Hydrotherapy also implies less use of epidural analgesia according to our results. While in the hydrotherapy group, one in five women used an epidural (20%), in the group that did not use hydrotherapy, the demand for this technique was higher, with two in five women using an epidural (40%), admitting significant differences between the two groups, which associate hydrotherapy with fewer epidurals. We also found results in the literature indicating even less use of the epidural technique with water immersion, such as the study by Camargo et al. [29], where 91.1% of women felt comfortable and remained in the water, only 5.6% wanted to stop using water, and just 1.1% used epidural analgesia. In the study by Bayle et al. [1], the use of other drugs for pain relief varied from 10.2% to 18.5% between the group that used water and the group that did not use water, respectively.

This study may present some selection bias, both from the women themselves and the healthcare professionals attending the births. Regarding bias among the participant women, there may be bias due to the self-selection of hydrotherapy use during childbirth. The participant women may have been previously conditioned regarding the use of hydrotherapy during the birthing process.

Regarding healthcare professionals, bias may also exist due to their desire to promote or discourage the use of hydrotherapy, based on personal interest in its use or a lack of knowledge and training in the techniques involved.

Our study spanned over ten years, and many healthcare professionals have been involved throughout this period, so it is not possible to determine if there were any staff who promoted or discouraged the use of hydrotherapy during childbirth.

Future research should recognize the importance of including clinical trials in which sample selection considers the pain tolerance of the selected women, as well as relevant variables such as parity and prior knowledge of the technique. The inclusion of these variables could improve internal validity and data extrapolation.

## 5. Conclusions

Our data show that hydrotherapy was associated with a longer time to delivery. Additionally, hydrotherapy was also associated with a lower perception of pain and a lower frequency of requests for epidural analgesia.

**Author Contributions:** Conceptualization, R.R.-B., J.C.-M., E.M.-G. and J.C.S.-G.; data curation, J.C.-M., L.D.-R., J.C.S.-G. and J.C.H.M.; formal analysis, R.R.-B., J.C.-M., J.C.S.-G. and J.C.H.M.; investigation, R.R.-B., L.D.-R., E.M.-G. and J.C.S.-G.; methodology, E.M.-G., R.R.-B. and L.D.-R.; project administration, R.R.-B., B.P.-S., J.C.-M. and J.C.S.-G.; resources, E.M.-G., J.C.S.-G., R.R.-B. and L.D.-R.; supervision, L.D.-R. and R.R.-B.; validation, R.R.-B., J.C.-M., L.D.-R., B.P.-S. and E.M.-G.; visualization, R.R.-B., J.C.-M. and L.D.-R.; writing—original draft preparation, J.C.-M., R.R.-B., E.M.-G. and J.C.S.-G.; writing—review and editing, R.R.-B., J.C.-M., B.P.-S., E.M.-G., L.D.-R. and J.C.S.-G. All authors have read and agreed to the published version of the manuscript.

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**Institutional Review Board Statement:** The Ethics Committee of the Hospital Costa del Sol approved this study in November 2018 under reference number 002_oct18_PI-hydrotherapy birth, thus ensuring the ethical compliance of the research in question.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Data regarding this study are available upon request from the corresponding author.

**Public Involvement Statement:** There was no public involvement in any aspect of this research.

**Guidelines and Standards Statement:** This manuscript was drafted according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) approach, and the associated guidelines were followed in this observational study.

**Use of Artificial Intelligence:** AI or AI-assisted tools were not used in drafting any aspect of this manuscript.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

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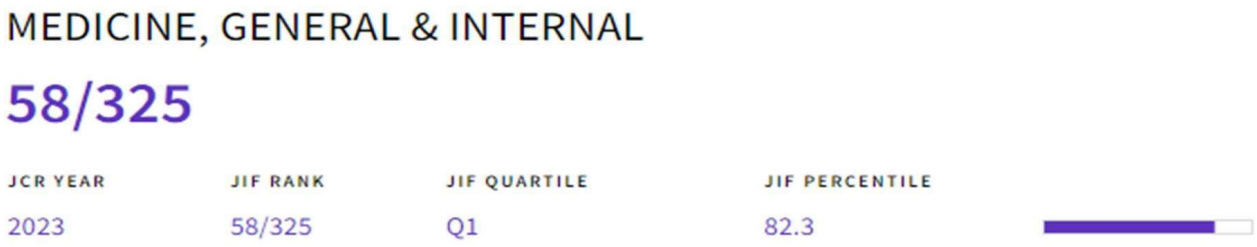
# *Artículo 3:*

Mellado-García E, Díaz-Rodríguez L, Cortés-Martín J, Sánchez-García JC, Piqueras-Sola B, Rodríguez-Blanque R. Safety and Effect of the Use of Hydrotherapy during Labour: A Retrospective Observational Study. *Journal of Clinical Medicine*. 2023; 12(17):5617. https://doi.org/10.3390/jcm12175617



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*Clinical Medicine*

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*Article*

# Safety and Effect of the Use of Hydrotherapy during Labour: A Retrospective Observational Study

**Elena Mellado-García [1,2], Lourdes Díaz-Rodríguez [1,3], Jonathan Cortés-Martín [1,3], Juan Carlos Sánchez-García [1,3,*], Beatriz Piqueras-Sola [1,4] and Raquel Rodríguez-Blanque [1,3,5]**

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**Abstract:** Background: Hydrotherapy is a technique used for pain management during labour, but its safety for both the mother and foetus remains uncertain. Objective: The main aim of this study is to determine whether the use of hydrotherapy in the first stage of labour is safe for both the mother and newborn. Methods: A retrospective observational study was conducted to collect data from the partogram, maternal and neonatal history. Results: A total of 377 women who gave birth at the Costa del Sol Hospital in Malaga between January 2010 and December 2020 were randomly selected. They were divided into a control group (253 women) and an intervention group (124 women) that used hydrotherapy in the first stage of labour. There were no significant differences between the groups in terms of age, history of previous miscarriages, type of delivery, or newborn weight. The results showed that most women who opted for hydrotherapy were nulliparous, and the use of hydrotherapy during labour was safe for both the mother and foetus. There were no significant differences in the variables of maternal arterial hypotension, postpartum haemorrhage, postpartum maternal fever, foetal complications, neonatal admission, 1 and 5 min Apgar scores, umbilical arterial or venous pH, or foetal cardiotocographic recording. However, there was a significant difference ($p = 0.005$) in the rate of breastfeeding among mothers who opted for hydrotherapy (96% vs. 85.7%). Conclusions: The use of hydrotherapy during the first stage of labour is safe and is associated with increased breastfeeding rates compared to conventional delivery.

**Keywords:** hydrotherapy; labour; delivery; analgesia; pregnancy; maternal-foetal safety



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## 1. Introduction

The use of water as a therapeutic medium is not new, although its exact origins are not known. However, there is evidence of ancient cultures such as China, Egypt, Japan, Greece, and Rome using water as a treatment for physical and psychological ailments. In addition, there are bibliographic references [1] to clinical care that mention how, throughout history, immersion in water has been used during childbirth as a means of relaxation and pain relief.

Hydrotherapy is a method that focuses on pregnant women, especially during childbirth, which is why many women find it comfortable and useful [2]. In fact, the possibility of a water birth is a highly desirable experience for many families [3]. Women's demands and the extremes to which some medical procedures can escalate have led to the search for alternatives for a natural and physiological birth. Water birth appears to empower and improve the skills of women who choose this option, and the use of hydrotherapy can enhance their experience during childbirth [4].

The benefits of water, such as buoyancy, hydrostatic pressure, and temperature, are relevant and beneficial to women during the birth process, as numerous studies have shown. These benefits include positive effects on the maternal experience of labour, such as reduced use of epidurals, improved ability to cope with pain, shorter labour, greater sense of control during the process, and increased comfort and ability to adopt comfortable positions [5]. A Cochrane review of 15 trials involving 3663 women, all comparing immersion with non-immersion, identified a number of physical and emotional benefits for labouring women associated with warm water immersion [1]. These benefits included a higher pain threshold, shorter labour, less medical intervention, greater relaxation, and overall satisfaction with the birth experience [1].

However, there is controversy about neonatal outcomes and baby safety. Associations such as the American College of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics (AAP) argue that the potential risks to the newborn outweigh the benefits for the woman.

The American College of Nurse-Midwives (ACNM) position statement on hydrotherapy in labour and birth recommends that women be provided with evidence-based information about water birth and that it be available to those with uncomplicated pregnancies who desire this option [5].

In response to the positions of the associations, current studies present data analyses that report on various neonatal clinical outcomes when comparing births without the use of hydrotherapy and births with the use of hydrotherapy. These studies do not suggest that outcomes are worse for babies born by water birth [6].

These findings are echoed in studies such as that by Davies et al. (2015), which concludes that water birth does not appear to be associated with adverse neonatal outcomes in a sample of low-risk women [6].

Another study by Bailey et al. (2020) concludes that water birth is not associated with an increased neonatal risk, nor is there a higher incidence of extensive perineal lacerations or postpartum haemorrhage [5].

Other specific adverse neonatal outcomes, such as respiratory distress, anaemia, sepsis, hypoxic-ischemic encephalopathy, asphyxia, or death, did not show significant differences between the groups that used water immersion and those that did not [7].

The Clinical Practice Guideline on Normal Childbirth Care in Spain, which is currently in force, recommends warm water immersion as an effective method of pain relief in the late stages of the first stage of labour [8]. This guide defines the different stages of labour: the latent phase (from the beginning of labour to 4 cm of cervical dilation), the active phase (from 4 to 10 cm of cervical dilation), the second stage of labour (expulsion), and the third stage of labour (placental delivery). It is important to take these stages into account when assessing the obstetric, maternal, and neonatal risks and benefits associated with the use of hydrotherapy during childbirth.

The hypothesis of this study is that the use of hydrotherapy during childbirth is safe for both mother and newborn and does not show significant differences in the variables analysed, including maternal arterial hypotension, postpartum haemorrhage, postpartum maternal fever, foetal complications, neonatal admissions, Apgar scores at 1 and 5 min, arterial or venous pH of the umbilical cord, and foetal cardiotocographic record. In addition, it is hypothesised that the use of hydrotherapy during childbirth may increase breastfeeding rates compared to conventional childbirth.

The main aim of this study was to determine whether the use of hydrotherapy in the first stage of labour is safe for both the mother and newborn.

Secondary objectives are:

- To study maternal perinatal outcomes.
- To study foetal outcomes of the use of hydrotherapy during labour.

## 2. Materials and Methods

### 2.1. Study Design

This is a retrospective observational study. The study was conducted in accordance with the Declaration of Helsinki for research on human subjects and was approved by the Ethics Committee of Costa del Sol Hospital (002_oct18_PI-hydrotherapy labour) in November 2018.

### 2.2. Setting

Women who gave birth at Costa del Sol Hospital between January 2010 and December 2020 were randomly selected from an anonymous database and retrospectively included in our observational study. The randomisation of the database was performed by the hospital's IT department using computer software.

Data collection took place between September 2021 and May 2022 in the hospital's clinical documentation unit, with data collected from the partogram, including clinical data on the mother, newborn, and delivery. For this purpose, a password-protected database was designed with various logical mechanisms to prevent the introduction of erroneous data.

Data analysis was performed from June 2022 to September 2022.

### 2.3. Participants

The inclusion criteria for the study were low-risk pregnant women, at term, with a singleton pregnancy, cephalic presentation, and need for hospital admission for delivery, with induction or spontaneous onset of labour.

The study was carried out on patients who gave birth at the Costa del Sol Hospital in Málaga.

Two groups were formed: the intervention group, consisting of women who used hydrotherapy during the first stage of labour, and a second control group who did not use hydrotherapy during labour.

Exclusion criteria were pregnant women with a twin pregnancy, pregnancies that began prematurely (<37 weeks), or post-term (>42 weeks).

### 2.4. Variables

#### 2.4.1. Sociodemographic and Anthropometric Variables

Age: the age of participants was recorded in years.

Parity: The GAPV formula (pregnancy-miscarriage-live birth) was used to record the parity of the pregnant women who participated in the study. For data analysis, it was classified as Nulliparous (no previous births) and Multiparous (one or more previous births).

#### 2.4.2. Variables Related to the Intervention

Type of delivery: the categories considered for the end of the second stage of labour were spontaneous vaginal delivery, vacuum-assisted delivery, forceps-assisted delivery, and caesarean section.

The duration of the use of hydrotherapy during the first and/or second stage of labour was defined in minutes.

#### 2.4.3. Maternal Outcome Variables

Postpartum perineal: classified as intact, first-degree tear, second-degree tear, third-degree tear, fourth-degree tear [9], and episiotomy.

Maternal hypotension: recorded in millimetres of mercury (<90/60 mmHg).

Fever: for analysis, fever was recorded if the temperature was >38 °C; no fever if the temperature was <38 °C.

Postpartum haemorrhage: yes/no.

Breastfeeding: yes/no.

2.4.4. Variables Related to Foetal and Neonatal Outcomes

Foetal cardiotocographic recording during dilation and expulsion, data collected according to the clinical practice guidelines of the National Health System [8]: reassuring CTG, non-reassuring CTG, abnormal CTG.

Neonatal weight: measured in grams.

Apgar score [10] at 1 and 5 min after birth.

Venous and arterial pH.

Admission to neonatal unit: yes/no.

### 2.5. Bias

In order to avoid bias in the collection of data related to the variables to be considered, a database (Db) was designed, protected by a key, and equipped with various logical mechanisms to prevent the introduction of false data. Only the researchers involved in this project could access the database. It should be noted that the identifying data of the patients were separated in a second Db with a different access key. In this latter Db, only the principal investigator had access, and all researchers were committed to respecting the confidentiality of the data in accordance with the Personal Data Protection Law of 8 November 2018, and Law 41/2002 of 14 November, which is fundamental and regulates the autonomy of patients and their rights and obligations in terms of clinical information and documentation.

### 2.6. Study Size

The sample size calculated for this study was 248 pregnant women, with 124 in the control group and 124 in the hydrotherapy group (assuming a loss rate of 10% in the medical history assessment, with 80% power). The sample was later increased to 377 women as it was considered necessary to subdivide the main groups in order to extend and improve the study.

### 2.7. Statistical Methods

Descriptive analysis was performed using measures of central tendency, dispersion, and position (median and interquartile range (P75–P25)) for quantitative variables and frequency distribution for qualitative variables. To assess differences between study groups (absence vs. presence of hydrotherapy), the chi-squared test (or Fisher's exact test if expected frequencies were less than 5) was used for qualitative variables, while Student's *t*-test (or Mann–Whitney U test if the distribution was non-normal) was used for quantitative variables. Multivariate logistic regressions were performed between the following variables: postpartum haemorrhage, postpartum perineal status (comparing intact vs. first-degree tear, second-degree tear, third-degree tear, and episiotomy), foetal complications, neonatal admission, abnormal RCTGF signs, maternal arterial hypotension, and maternal fever. Each model was adjusted for age and number of pregnancies (1, 2 and 3 or more).

For all analyses, the level of statistical significance was set at $p < 0.05$. The analysis was performed using SPSS vs. 28.0 program for Windows (IBM Corporation, Armonk, NY, USA) statistical software.

### 2.8. Intervention

The intervention consisted of collecting data from patients who used hydrotherapy in the first stage of labour to compare with data of patients who did not use hydrotherapy.

The data were directly collected from the paper partogram in the pregnant woman's medical record. The clinical documentation unit allowed personal access to the data. Once the data were obtained, statistical analysis was performed.

## 3. Results

After analysing the collected data in this study, we observed notable characteristics in the sample, particularly differences in previous pregnancies and childbirths of the women under analysis that showed statistically significant variations. These data are shown in Table 1.

**Table 1.** Comparison of Characteristics between Patients who Received Hydrotherapy and those who Did Not.

| | | Hydrotherapy | | | | *p* |
|---|---|---|---|---|---|---|
| | | Absence | | Presence | | |
| | | *n* | % | *n* | % | |
| Total | | 253 | 67.1 | 124 | 32.9 | |
| Age | | | | | | |
| | Mean—SD | 32.5 | 5.3 | 31.7 | 5.6 | 0.103 |
| Gestation | | | | | | |
| | 1 | 81 | 56.6 | 62 | 43.4 | 0.002 |
| | 2 | 94 | 71.2 | 38 | 28.8 | |
| | 3 or more | 78 | 76.5 | 24 | 23.5 | |
| Miscarriages | | | | | | |
| | Absence | 201 | 67.9 | 95 | 32.1 | 0.62 |
| | Presence | 52 | 64.2 | 59 | 35.8 | |
| Previous births | | | | | | |
| | 0 | 94 | 55 | 77 | 45 | <0.001 |
| | 1 | 109 | 73.2 | 40 | 26.8 | |
| | 2 or more | 50 | 87.7 | 7 | 12.3 | |
| Type of delivery | | | | | | |
| | Normal | 236 | 93.3 | 121 | 97.6 | 0.132 |
| | Dystocic | 17 | 6.7 | 3 | 2.4 | |
| Newborn weight (grams) | | | | | | |
| | Mean—SD | 3321.9 | 446.3 | 3306.3 | 378.8 | 0.369 |

On the other hand, a descriptive analysis was conducted regarding the time spent using hydrotherapy among women who chose this technique during the first stage and/or second stage of labour. The results are presented in Table 2.

**Table 2.** Time using hydrotherapy.

| | |
|---|---|
| n | 124 |
| Mean | 86.66 |
| Median | 62.5 |
| Standard deviation | 82.69 |
| Minimum | 10 |
| Maximum | 615 |
| Percentile 25 | 45 |
| Percentile 75 | 108.75 |

### 3.1. Perinatal Complications

Among the maternal outcome data regarding postpartum haemorrhage, it was observed that 2.4% of pregnant women who did not receive hydrotherapy experienced postpartum haemorrhage, compared to 4.8% of women who received hydrotherapy. The *p*-value of the Fisher exact test is 0.22, indicating that the differences are not significant.

### 3.2. Safety of Hydrotherapy for the Mother

The presence or absence of intact perineal status was examined for differences between the groups ($p = 0.651$), and no statistically significant differences were found (Table 3).

**Table 3.** Perineal Status No Hydrotherapy vs. Hydrotherapy.

| Hydrotherapy | No Hydrotherapy | Perineal Status |
|---|---|---|
| 39 (31.5%) | 87 (34.4%) | Intact |
| 45 (36.3%) | 82 (32.4%) | 1st degree |
| 31 (25.0%) | 57 (22.5%) | 2nd degree |
| 1 (0.8%) | 3 (1.2%) | 3rd degree |
| 8 (6.5%) | 24 (9.5%) | Episiotomy |

It was investigated whether the use of hydrotherapy affected maternal hypotension. No significant differences were found between the groups ($p = 1.000$), suggesting that there is no significant relationship between maternal hypotension and the use of hydrotherapy. In the group that did not use hydrotherapy, 5.1% had maternal hypotension, whereas in the group that used hydrotherapy, 5.6% had maternal hypotension.

The presence of maternal fever in the postpartum period was analysed, and no statistically significant differences ($p = 0.550$) were found between the groups.

### 3.3. Foetal Safety of Maternal Use of Hydrotherapy

Analysis of neonatal outcomes showed no statistically significant differences between the groups in terms of neonatal complications or neonatal admissions ($p = 0.540$). There were no complications in 96% of newborns from mothers who chose to use water therapy during labour, and in 97.2% of cases where water therapy was not used. There were no differences in neonatal admissions ($p = 0.846$); however, the hydrotherapy group had a lower percentage of newborns admitted to the neonatal unit (4.8% vs. 5.9% in the non-hydrotherapy group).

In both groups, Apgar scores were analysed at 1 min and 5 min after birth. Apgar scores analysed at 1 min after birth showed no significant differences between the groups ($p = 0.782$). In the group that did not receive hydrotherapy, one newborn had an Apgar score of two, indicating severe neonatal depression at birth, and two newborns had Apgar scores between four and six, indicating moderate depression. The neonates in this group had normal Apgar scores between seven and ten in 98.8% of cases. In the hydrotherapy group, one newborn had an Apgar score between four and six, indicating moderate depression, and 99.2% of this group had scores between seven and ten, indicating normal newborn status.

In the analysis of the Apgar scores at 5 min in both groups, scores between seven and ten points were obtained, with the highest scores (ten points) observed in 98.4% of cases in the group that used hydrotherapy and in 96.4% of cases in the group that did not use hydrotherapy during delivery. No significant differences were found in the analysis, indicating good health of the newborns in the group that used hydrotherapy.

No statistically significant differences were found in the results of the foetal cardiotocographic recording (RCTGF) ($p = 0.234$). Calming RCTGF were present in 90.1% of the hydrotherapy group and 94.4% of the hydrotherapy group. In the group that did not use hydrotherapy, three RCTGF were abnormal and 22 were not sedative. These numbers decreased in the group that used hydrotherapy, where there were no abnormal RCTGF and seven non-sedating RCTGF.

The neonates' venous and arterial pH levels were recorded. There were no statistically significant differences in venous pH between the groups ($p = 0.490$), with values of pH = 7.35 $\pm$ 0.071 in the group of women who received hydrotherapy and pH = 7.353 $\pm$ 0.064 in the group of women who received conventional treatment. The arterial pH values were also not significant ($p = 0.400$), with values of pH = 7.291 $\pm$ 0.086 in women in the hydrotherapy group compared to pH = 7.287 $\pm$ 0.088 in women who did not receive hydrotherapy.

Significant differences ($p$ = 0.005) were found in favour of the hydrotherapy group who decided to breastfeed (96% vs. 85.7%). The comparison between the two groups showed that more women in the hydrotherapy group breastfed their newborns.

### 3.4. Multivariate Analysis to Reduce Risk of Bias

In the multivariate logistic regression model related to the presence of postpartum haemorrhage, hydrotherapy patients have an odds ratio (Exp(B)) of 2.487 (95%CI 0.75–8.22), although not significant ($p$ = 0.135). The same is true for postpartum perineal status, which has an odds ratio (Exp(B)) of 1.039 (95%CI 0.64–1.68), which is not significant ($p$ = 0.876). For the presence of foetal complications, these patients had an odds ratio (Exp(B)) of 1.533 (95%CI 0.46–5.10), not significant ($p$ = 0.486). For increased neonatal attendance in the neonatal unit, hydrotherapy patients had an odds ratio (Exp(B)) of 0.796 (95%CI 0.29–2.16), not significant ($p$ = 0.655). For the presence of foetal cardiotocographic record (FCRCF) in hydrotherapy patients, the odds ratio (Exp(B)) was 0.561 (95%CI 0.23–1.37), not significant ($p$ = 0.486). The presence of maternal hypotension in hydrotherapy patients was also not significant ($p$ = 0.655) and its odds ratio (Exp(B)) was 1.217 (95%CI 0.46–3.21). Finally, the presence of maternal fever in hydrotherapy patients was also not significant ($p$ = 0.203) and its odds ratio (Exp(B)) was 2.940 (95%CI 0.177–49.01).

## 4. Discussion

In this study, we aimed to determine the safety of using hydrotherapy during childbirth for both the mother and newborn. We conducted a retrospective observational study at the Costa del Sol Hospital in Malaga between January 2010 and December 2020. During this period, 377 women were randomly assigned to either a control group or an intervention group that received hydrotherapy during childbirth. The results showed that hydrotherapy during childbirth was safe and did not present significant differences in maternal arterial hypotension, postpartum haemorrhage, postpartum maternal fever, foetal complications, newborn admissions, Apgar scores at 1 and 5 min, arterial or venous pH of the umbilical cord, or foetal cardiotocography. In addition, a significant increase was observed in the rate of breastfeeding among mothers who opted for hydrotherapy.

According to our results, although we did not find significant differences in terms of types of delivery, there was a lower incidence of dystocic deliveries in the group that used hydrotherapy. These findings are consistent with previous studies, such as that of Liu et al. [11], who also reported a significant decrease in the caesarean rate among the group that used hydrotherapy during childbirth. Similarly, Herrera et al. [12] found results similar to ours, where most deliveries ended spontaneously, and no significant differences were observed between the groups. Furthermore, a randomised controlled trial conducted by Cluett et al. [13] also reported that immersion in water had no significant effects on the rates of surgical delivery.

Regarding the parity of pregnant women, i.e., whether they are primiparous or multiparous, our results show that the intervention group had a high percentage of primiparous women (45%). However, this finding contrasts with other studies, such as Lewis et al. [14], who found significant differences among multiparous women, These women were more likely to use hydrotherapy and give birth in water. Despite this, both studies concur that hydrotherapy increases the chances of having a spontaneous vaginal delivery by respecting the natural progression of labour and minimizing unnecessary interventions. The difference between our results and those of Lewis et al. [14] may be due to a greater culture of hydrotherapy use among pregnant women, as it is a "young" technique in Spain. Cluett et al. [1] concluded that "water birth, under the supervision of a midwife, can be an option for slow labour progression, reducing the need for obstetric intervention." They also reported that the use of hydrotherapy can reduce the rate of caesarean sections by providing personalised care to the woman during childbirth.

Our results include information on the effects that the use of hydrotherapy in childbirth can have on maternal health. These findings are supported by other studies in which no adverse effects were observed for the mother [1,11,12,15–17]. For example, Herrera et al. [12] did not observe infectious effects such as endometritis, puerperal fever, or puerperal sepsis. In our study, there were no significant differences in fever occurrences between the group that used hydrotherapy and the group that did not. Lim et al. [17] conducted a retrospective review in Singapore and found no significant differences in terms of postpartum haemorrhage, maternal infection, and perineal tears. They concluded that water birth does not seem to be associated with adverse maternal health outcomes. Gayiti et al. [18] conducted a retrospective study and did not find an increased risk for mothers in births where hydrotherapy was used.

According to the results of two meta-analyses, one conducted by Taliento et al. [19], including data from 212,843 women, and another conducted by Burns et al. [20], compiling the results of 15 studies with data from 63,891 women, both agree that the group that used hydrotherapy during labour had a lower risk of postpartum haemorrhage than the group that did not use it. Additionally, an observational cohort study [21] with a sample of 46,088 women also reported an association between water birth and a reduction in the incidence of postpartum haemorrhage. However, in our study, although we did not find significant differences, we observed a higher incidence of postpartum haemorrhage in the group that used hydrotherapy. We believe that this may be due to the active or physiological management of the third stage of labour. In our study, since no delivery occurred in water, the third stage was carried out outside of the water without the use of hydrotherapy, similar to the group that did not use it.

Furthermore, we found that the use of hydrotherapy is not related to a higher risk of tears, and there is also a lower number of episiotomies in women who use hydrotherapy. These results are supported by our study and other recent studies [1,3,20,22]. However, we also encountered a contrasting report by Bovbjerg et al. [23], who reported an 11% increase in the likelihood of experiencing some perineal trauma. They claim that this finding requires further investigation and could be a misclassification bias among women with complicated deliveries and the suspension of hydrotherapy use.

In this study, our results are consistent with previous research on the use of hydrotherapy in relation to maternal outcomes, such as perineal status and maternal infection. In 2014, the American Academy of Pediatrics (AAP) and The American College of Obstetricians and Gynecologists (ACOG) published a clinical report indicating the possible maternal benefits of hydrotherapy during the first stage of labour. However, there was controversy regarding neonatal outcomes in births with the use of hydrotherapy.

We can state that, with respect to neonatal outcomes and current scientific evidence, multiple comparative studies between births with hydrotherapy and traditional births have concluded and ensured that water birth is not associated with a higher incidence of adverse neonatal outcomes. Various types of studies from different sources [11,17,18,23,24] support similar morbidity and mortality results in groups that have used hydrotherapy compared to those who have not. An example is the Cochrane review [1], which found no evidence of increased adverse effects in births with the use of hydrotherapy.

In our study, we did not find significant differences in Apgar scores between newborns in both groups. This result is consistent with several previous studies [1,11,12,23,25,26] that also found no significant differences in Apgar scores and showed adequate extrauterine adaptation without infectious adverse effects. In addition, Mallen et al. [25] concluded that there is a lower risk of infection in the group that uses hydrotherapy. Other studies [1,11,15,16,23,27,28] also reported no significant differences in neonatal infection rates, suggesting that water birth does not carry a higher risk, and that there were no significant differences in arterial and venous pH results or in admissions to the neonatal intensive care unit [1,20,23,25–27].

Multivariate analysis was performed due to the large number of variables used in the study, to avoid confounding bias in this type of design. None of the models showed statistical significance for the presence of hydrotherapy. This is highly significant in our study as it indicates that the use of hydrotherapy during labour does not present a greater risk than labour without the use of hydrotherapy for experiencing any of the complications expressed in the study variables.

## 5. Conclusions

It is important to note that this study was conducted in a specific hospital and its results may not be generalisable to other settings. However, the findings are promising and suggest that hydrotherapy during labour can be a safe and effective option during labour and delivery. Additionally, the use of hydrotherapy during labour may also have additional benefits, such as increasing rates of breastfeeding.

In conclusion, the study suggests that the use of hydrotherapy during the first stage of labour is safe and may have additional benefits, such as increased breastfeeding rates.

In summary, research on hydrotherapy during labour is ongoing, and more studies are needed to fully understand its safety and effectiveness.

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# *Artículo 4:*

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# Hydrotherapy in Pain Management in Pregnant Women: A Meta-Analysis of Randomized Clinical Trials

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**Abstract: Background**: the benefits of water are significant during the birth process. Improved maternal experience of labor, less use of epidurals, better pain management, shorter labor, and a greater sense of control are observed during the birth process. **Objective**: This report aims to determine the benefits of hydrotherapy in clinical childbirth approaches and its applicability in pain control. **Methods:** A meta-analysis of randomized clinical trials selected from various databases with no publication date limits was conducted, comparing groups that did not use hydrotherapy with groups that did during labor. **Results:** Seven articles met the inclusion criteria, with five articles using hot water immersion and two using hot water shower as hydrotherapy treatments. This study identified 840 participants, with the intervention groups including 417 term pregnant women and the control groups including 423 pregnant women. The effect size of hydrotherapy on pain was calculated using the visual analog scale in five articles and analgesic use in the other two articles. Hydrotherapy significantly reduced pain during labor with a mean difference of −0.97 (95% CI: −1.91 to −0.03; $I^2 = 97.32\%$, $p < 0.001$). The duration of the first stage of labor was not significantly affected, with a mean difference of −0.17 h (95% CI: −0.55 to 0.21; $I^2 = 56.75\%$, $p = 0.059$). Additionally, hydrotherapy did not significantly impact the newborns' Apgar scores at 5 min, with a mean difference of 0.18 (95% CI: −0.48 to 0.85; $I^2 = 2.15\%$, $p = 0.939$). **Conclusions:** Hydrotherapy is beneficial for pain control in the first stage of labor and does not increase its duration or negatively affect the Apgar score of newborns.

**Keywords:** hydrotherapy; waterbirth; immersion; first labor stage; neonatal health; maternal health



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## 1. Introduction

The use of water as a therapeutic medium has ancient origins, with evidence showing its use in China, Egypt, Japan, Greece, and Rome for treating physical and psychological ailments. In their literature review, Cluett, Burns, and Cuthbert report on the existence of historical references documenting the use of water immersion during childbirth for the purpose of achieving relaxation and pain relief [1]. Hydrotherapy during childbirth focuses on the comfort and support of pregnant women, and many find this method beneficial [2]. Water can be used during the first stage of labor (dilation), the second stage (expulsion), or both. In Spain, the Clinical Practice Guideline on Normal Childbirth recommends warm water immersion as an effective pain relief method during the active first stage of labor [3].

This method has several key features that make it an attractive option. Hydrotherapy is primarily used during the first stage of labor, when contractions are most intense and cervical dilation is in progress. The water temperature is typically maintained around 37.4 °C, which is comfortable for the mother and safe for the newborn. The water helps reduce pain and stress and can accelerate the dilation process. Warm water relaxes the muscles, reduces the perception of pain, and decreases the need for epidural analgesia.

Additionally, the buoyancy of the water allows women to move more freely and adopt more comfortable positions during labor, which can relieve pressure in certain areas of the body. Moreover, the reduced gravity and abdominal pressure facilitate fetal rotation and descent, providing further advantages of hydrotherapy [4,5].

Defining the stages of labor is essential: the first stage (the latent phase from the beginning to 4 cm of cervical dilation and the active phase from 4 cm to 10 cm of cervical dilation), the second stage (expulsion), and the third stage (delivery of the placenta). Proper definition helps differentiate the maternal and neonatal risks and benefits of hydrotherapy [3].

A woman should give birth in a place where she feels secure and receives appropriate care (International Federation of Gynecology and Obstetrics, 1982). Hydrotherapy can enhance the childbirth experience and maternal health, as indicated by a qualitative study involving 23 women [6]. The benefits of water, such as buoyancy, hydrostatic pressure, and temperature, positively affect the dilation process. Studies report reduced epidurals use, better pain management, and shorter labor durations [7–9]. A systematic review and meta-analysis by Burns et al. (2022) [10] indicated a trend favoring water immersion for pain relief since 2009.

A Cochrane review of 15 trials involving 3663 women [1] compared water immersion with non-immersion. Eight studies involved water immersion during the first stage, and four involved it during both stages. The review found physical and emotional benefits [1], including higher pain thresholds, shorter dilation stages, reduced medical intervention, improved relaxation, and greater overall satisfaction with childbirth [11].

A cross-sectional study at São Bernardo Hospital in Portugal evaluated maternal and neonatal outcomes during labor stages. Excellent Apgar scores and pain relief were reported by 98.9% of the 90 women, with immersion time influencing labor duration significantly [12].

Despite these findings, some associations, such as the American College of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics (AAP) [13], discuss neonatal outcomes and safety, emphasizing the need for more high-quality studies.

Contrary to these concerns, Burns et al.'s meta-analysis [10] reported clear benefits for women and newborns from hydrotherapy, with no worse outcomes for water births. Other studies compare births with and without hydrotherapy and do not suggest worse outcomes for babies born through water birth [7,14]. The American College of Nurse-Midwives (ACNM) recommends providing evidence-based information on water birth for uncomplicated pregnancies [7].

A systematic review by Jacoby et al. [15] found varying perinatal outcomes for hydrotherapy, highlighting the need for further research. Meta-analyses and reviews of observational studies, including over 30,000 births, do not demonstrate increased risks for mothers or babies.

This meta-analysis aims to address pain management during the first stage of labor using minimally invasive techniques, enhancing healthcare quality and supporting the use of hydrotherapy for its beneficial impact on labor times and safety.

*Objectives*

The primary objective is to determine the benefits of hydrotherapy in clinical childbirth approaches and its applicability in pain control. The secondary objectives include assessing its impact on the duration of the first stage of labor and the newborns' physical condition.

## 2. Materials and Methods

### *2.1. Review Protocol*

This systematic review and meta-analysis followed the PRISMA protocol and was registered with PROSPERO (CRD42023399625).

### *2.2. Search Strategy and Inclusion Criteria*

Studies were selected based on the PICOS criteria (participants, interventions, comparisons, outcomes, and study design). Articles using the RCT methodology and involving

pregnant women in the first stage of labor receiving hydrotherapy treatment were included. Two of the investigators (J.C.S.-G. and E.M.-G.) searched the Scopus, PubMed, Cinahl, and WOS databases. A manual search was also performed using the reference lists of studies to find other relevant research.

The structured language used was obtained using MeSH terms and Health Sciences (DeCS) descriptors. The descriptors used were "labor stage, first" and "immersion" along with the corresponding natural language descriptors, using the Boolean operator AND. Supplementary Table S1 shows the search strategy employed for each of the databases consulted, along with the dates on which the searches were conducted. The searches were performed without a year filter to obtain all relevant information related to the objective of the search. The articles were collected between December 2022 and January 2023.

### 2.3. Data Extraction and Quality Assessment

After carrying out the search strategy, the articles found were transferred to the Mendeley web application using the Mendeley web importer tool. They were then organized into folders according to the database from which they were obtained, and all duplicates were removed. The included studies were RCTs that met the objective of the search. Two reviewers (J.C.S.-G. and E.M.-G.) independently examined the title, abstract, and keywords of each study identified in the search and applied the inclusion and exclusion criteria. The same procedure was applied to potentially eligible full-text articles. Differences between reviewers were resolved by discussion or by a third reviewer (R.R.-B.).

Data on the quality, patient characteristics, interventions, and relevant outcomes were extracted independently by two reviewers (E.M.-G. and J.C.-M.).

Two reviewers (J.C.S.-G. and E.M.-G.) independently extracted the following data from each article: author, country and methodology of the study; intervention characteristics; sample size and sample distribution; weeks of gestation; sample selection criteria; and mean age. Regarding the results of the RCTs, we extracted the type of intervention, start of intervention, and duration of intervention, pain scale; furthermore, relative to the newborn, we assessed their physical condition at 5 min after birth. These data are reported in Table 1. The reviewers also assessed the strengths and weaknesses of each RCT.

**Table 1.** Characteristics of included trials.

| Author | Country | Method | Interventions Characteristics | | | | | | Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Gestation Weeks (Media) | Sample Size | Distribution of the Sample | Type of Population | Average Age | Type of Intervention | Intervention Time | Pain Scale | Physical Condition of the Newborn |
| Chaichian, 2009 [16] | Iran | RCT | 37–42 weeks | 106 | EG 53; CG 53 | No risks | EG: 26.4 ± 5.9; CG: 27.1 ± 5.9 | Warm water pools | On demand | Use of analgesics | Not reported |
| Cluett et al., 2004 [17] | England | RCT | EG: 284 ± 7 days; CG: 280 ± 8 days | 99 | EG: 49; CG: 50 | Nulliparous women with dystocia and low risk of complications | EG: 26.0 ± 4.8; CG: 24.8 ± 6.0 | Warm water pools | Maximum 4 h in the pool | Visual Analog Scale | Apgar 5 min |
| Eckert, Turnbull and MCallister, 2001 [18] | Australia | RCT | EG: 39.9 ± 1,0; CG: 39.9 ± 1,0 | 274 | EG: 137; CG: 137 | Singleton pregnancy. No risks | EG: 28.4 ± 5.4; CG: 27.2 ± 5.1 | Warm water pools | On demand during the first stage of labor | Visual Analog Scale | Apgar 5 min |
| Schorn, McAllister and Blanco, 1993 [19] | USA | RCT | EG: 39.1 ± 1.4; CG: 39.2 ± 1.1 | 93 | EG: 45; CG: 48 | Intact membranes and no obstetric risks | EG: 21.4 ± 4.6; CG: 22.6 ± 6.1 | Warm water pools | On demand | Use of analgesics | Apgar 5 min |
| Lee et al., 2013 [20] | Taiwan | RCT | EG: 38.91 ± 1.26; CG: 39.19 ± 1.05 | 80 | EG: 39; CG: 41 | Pregnant women with a single foetus with no risk of complications | EG: 31.44 ± 3.85; CG: 31.83 ± 4.62 | Warm showers | 20 min per shower | Visual Analog Scale for Pain (VASP) | Not reported |
| Solt and Kanza Gul, 2022 [21] | Turkey | RCT | EG: 39.2 ± 0.8; CG: 39.2 ± 0.8 | 80 | EG: 40; CG: 40 | Primiparas between 20 and 40 years old, single foetus. | EG: 28.7 ± 3.1; CG: 28.3 ± 3.2 | Warm showers | 20 min per shower (18 showers) | Visual Analog Scale | Apgar 5 min |
| da Silva et al., 2009 [22] | Brazil | RCT | EG: 39.5 ± 0.9; CG: 39.5 ± 1.1 | 108 | EG: 54; CG: 54 | Uncomplicated full-term pregnancies | EG: 19.7 ± 3.6; CG: 21.1 ± 4.1 | Warm water pools | 60 min | Visual Analog Scale | Apgar 5 min |

A methodological quality assessment was performed using the PEDro (Physiotherapy Evidence Database) scale, as the methodology corresponded to RCTs. Publication bias was determined by visual inspection of the funnel plots.

### 2.4. Statistical Analysis

Statistical analysis was performed by analyzing the mean difference between the hydrotherapy and control groups, calculated in each study by subtracting the mean change (post-intervention minus pre-intervention) in the control group from the mean change in the hydrotherapy group.

The effect size of the intervention was studied by analyzing Cohen's d for each of the studies, using random-effects models based on the Sidik–Jonkman method. Cohen's d values below 0.20 indicate no effect; values between 0.21 and 0.49 indicate a small effect; values between 0.50 and 0.70 indicate a moderate effect; and values above 0.80 indicate a large effect [23]. Heterogeneity was assessed with the $I^2$ statistic, and its values were classified as non-significant (0–40%), moderate (30–60%), substantial (50–90%), or considerable (75–100%) [24]; the corresponding *p*-values were also considered.

Egger's regression asymmetry test was performed to assess publication bias, with $p < 0.10$ being considered statistically significant [25].

Meta-analyses were performed with the free and open-source statistical software Jamovi, Version 2.3.21.0, based on the R programming language.

Based on the information provided by this review, a series of premises are obtained as results that will serve to homogenize concepts about hydrotherapy during labor.

## 3. Results

Seven potentially eligible studies were identified by searching electronic databases, and none were identified through other sources. Details regarding the inclusion and exclusion of studies at each stage are provided in the flow chart [26] (Figure 1).

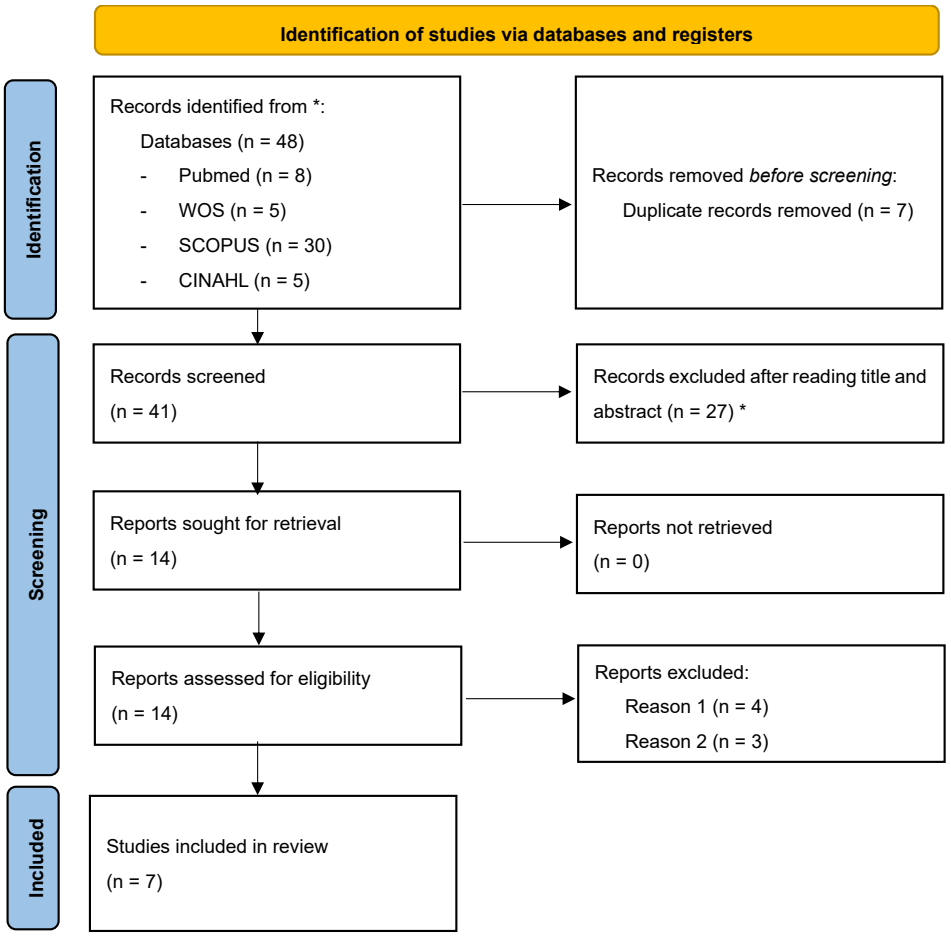


**Figure 1.** Flow diagram. * Did not meet the inclusion criteria. Reason 1: RCT protocols; Reason 2: systematic reviews of RCTs.

These seven studies included a total of 840 pregnant women. The intervention groups included 417 pregnant women at term, while the control groups included 423 pregnant women.

Five articles assessed pain during the first stage of labor using the visual analog scale (VAS) as a method, and two articles assessed pain during the first stage of labor using the percentage of analgesic medication use.

Table 1 summarizes the articles selected for the systematic review and meta-analysis.

Overall, the use of hydrotherapy reduced pain in the first stage of labor compared with the control group, showing considerable heterogeneity between studies (Pain, −0.97; 95% CI, −1.91 to −0.03; $I^2$ = 97.32%, $p < 0.001$ and n = 840) (Figure 2).

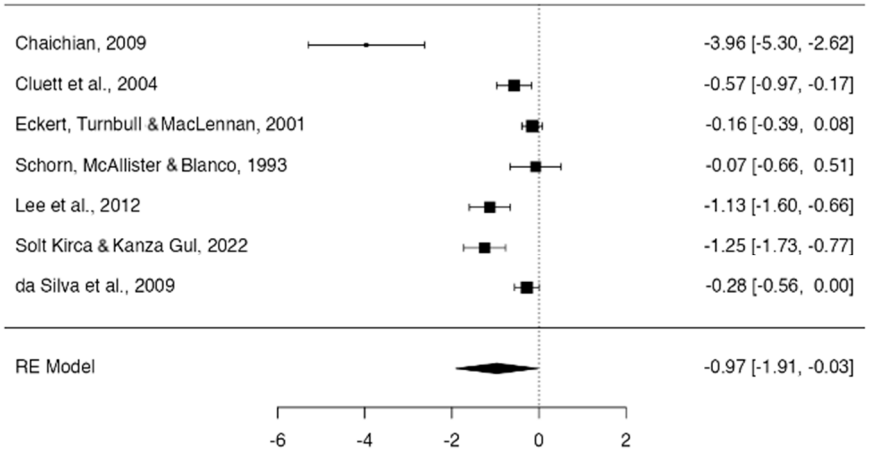


**Figure 2.** Forest plot use of hydrotherapy for pain [16–22].

The study with the largest effect size concerning pain assessment was that of Chaichian et al. [16], (d = −3.964). The studies by Lee et al. [20] and Solt Kirca and Kanza Gul [21] also presented large effects, with values of −1.127 and −1.2467, respectively. Cluett et al. [11] found a moderate effect (d = −0.5693), while da Silva et al. [22] found a small effect (d = −0.2789). Eckert, Turnbull, and MCallister [18] along with Schorn, McAllister, and Blanco [19] showed no effect on the intervention, with a Cohen's d of less than 0.20 (−0.1552 and −0.0736, respectively) (Figure 3).

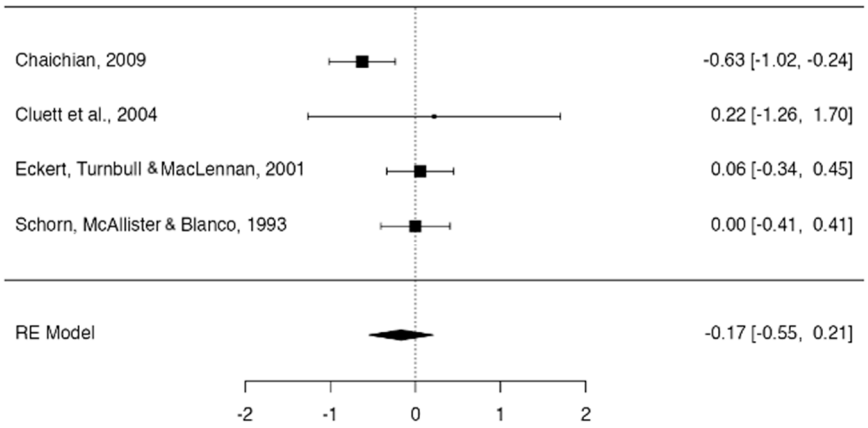


**Figure 3.** Forest plot use of hydrotherapy versus times in the first stage of labor [16–19].

However, the use of hydrotherapy did not significantly affect the duration of the first stage of labor, with moderate heterogeneity between studies (duration of the first stage of labor −0.17; 95% CI, −0.55 to 0.21; $I^2$ = 56.75%, $p$ = 0.059 and n = 572) (Figure 3).

Regarding the physical condition of the newborn, it was observed that the use of hydrotherapy does not affect the physical condition of the newborn, with homogeneity in the studies (Apgar 5 min, 0.18; 95% CI, −0.48 to 0.85; $I^2$ = 2.15%, $p$ = 0.939 and n = 654) (Figure 4).

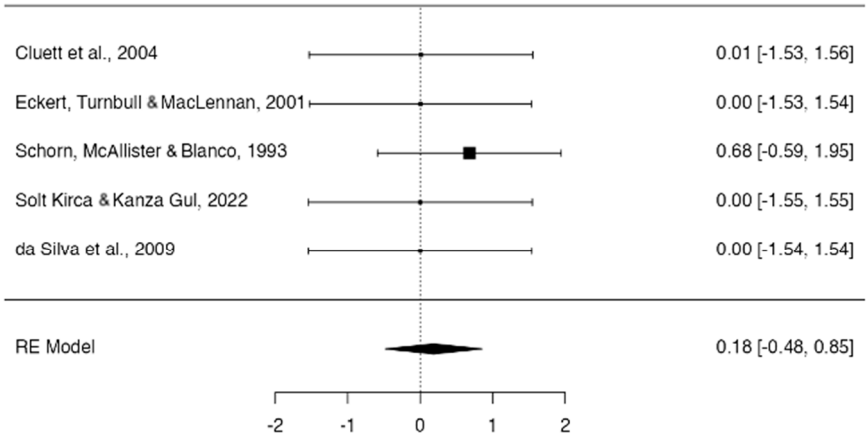


**Figure 4.** Forest plot use of hydrotherapy against the physical condition of newborns [17–19,21,22].

The assessment of methodological quality revealed that most of the information was obtained from trials with good methodological quality (Supplementary Table S2). However, all articles noted that blinding of participants, researchers, and groups was impossible due to the nature of the intervention performed during the first stage of labor.

Figure 5 shows the funnel plot used to assess publication bias in the studies included in the meta-analysis. The results of the conducted tests are as follows: the fail-safe N, which indicates the number of additional studies needed to nullify the meta-analysis results, is 48 ($p < 0.001$), suggesting a high robustness of the findings. Kendall's tau test yielded a value of −1.000 with a $p$-value of 0.003, indicating significant publication bias. Additionally, Egger's regression produced a coefficient of −4.553 with a $p$-value of less than 0.001, confirming the presence of publication bias. These combined results suggest that although the meta-analysis shows a significant effect, the potential impact of publication bias must be considered when interpreting the findings.

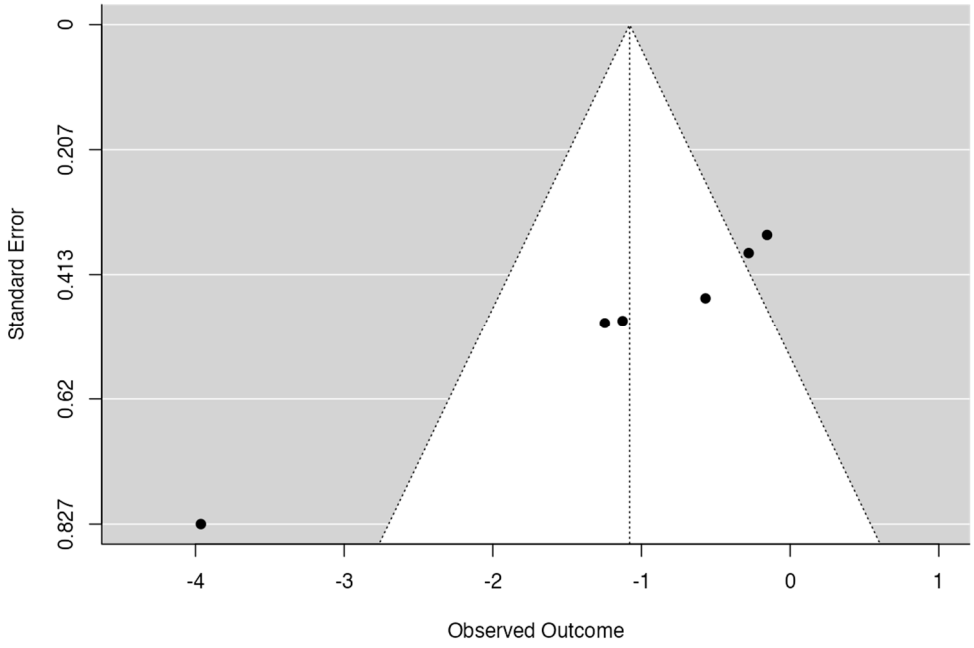


**Figure 5.** Funnel plot.

## 4. Discussion

This meta-analysis has enabled us to synthesize the current relevant findings on the use of hydrotherapy during the first stage of labor. The findings of this study contribute

to the evidence demonstrating significant differences in pain control during this stage between the groups using hydrotherapy and those following standard hospital procedures.

In this work, we found that the most studied outcome was pain during the first stage of labor among groups that used hydrotherapy compared with those that did not. These results indicated that hydrotherapy during labor was associated with lower pain scores in the hydrotherapy group. It should be noted that the measurement tools used in these studies varied, with most employing the visual analog pain scale [17,18,20–22], while some assessed pain through analgesic use [16,19]. Da Silva et al. [22] reported decreased pain in the water immersion groups compared with those that did not use hydrotherapy, combining this assessment with a behavioral pain scale between the two groups. Other studies also reported decreased pain in hydrotherapy groups at various times during the dilation phase compared with non-hydrotherapy groups that received conventional procedures such as amniotomy and oxytocin infusion [20,21]. However, no significant differences in mean scores for clinical or laboratory pain indicators were found in two articles [17,18]. A meta-analysis of the data shows that the effect size of hydrotherapy during the first stage of labor is significant compared with conventional procedures.

Although pain was perceived to be less in some studies, Eckert, Turnbull, and MCallister [18] noted that women's use of analgesia was greater in the hydrotherapy group. When contractions intensified, they needed to exit the water and discontinue hydrotherapy. However, in general, neither group demonstrated significant differences in the amount of pharmacological analgesia administered [17,19]. Conversely, Cluett et al. [17] showed that women using water immersion had a lower rate of epidural analgesia compared with those undergoing amniotomy and oxytocin without hydrotherapy.

In non-hydrotherapy groups, conventional management of labor, including amniotomy and oxytocin administration, was performed more frequently than in hydrotherapy groups [17,19,21].

This review found no differences in delivery types between hydrotherapy and non-hydrotherapy groups [16–19]. In a randomized controlled study by Chaichian et al. [16] involving 106 women, all women using hydrotherapy had natural birth, whereas 79.2% of those receiving conventional treatment had natural birth, although the differences were not significant. Similarly, Cluett et al. [17] found no significant differences in operative deliveries or the mean duration of the first stage of labor. Schorn et al. [19] also concluded that there were no significant differences in the duration of the first stage of labor with respect to minutes. In contrast, Chaichian et al. [16] found a significant difference in the active phase duration of the first stage of labor. The meta-analysis showed no statistically significant difference between hydrotherapy and conventional treatment in the duration of the first stage of labor ($p = 0.059$).

Neonatal outcome measures, including maternal infection rates related to neonatal infection, Apgar scores, fetal distress, or abnormal fetal cardiotocographic recordings, were similar between the two groups [16,17,19,21].

Although no differences were noted, Eckert, Turnbull, and MCallister [18] reported more use of oxygen masks and intermittent positive pressure ventilation in infants whose mothers used hydrotherapy.

Admissions to the neonatal unit were similar in both groups, with no significant differences. Cluett et al. [17] analyzed six admissions of infants born to women using water immersion and terminated in operative delivery, concluding that they experienced no subsequent problems.

Regarding maternal outcomes, Chaichian et al. [16] recorded 23% episiotomies in the non-hydrotherapy group, although tears were 12% higher in the water immersion group; however, the differences were minimal and not significant [16,17]. No differences were observed for hospital readmissions, postpartum endometritis, or postpartum pain at 24–48 h and at 8 months [17,19].

Eckert, Turnbull, and MCallister [18] assessed the birth experience, finding it more positive in the conventionally managed group in terms of relationship with staff, social support, information, choices and decisions, and satisfaction.

Birth using hydrotherapy has been shown to be more satisfying for women, which is attributed to the freedom of movement, intimacy, and reduced labor pain intensity, all positively influencing women's wellbeing and comfort [19]. However, studies such as Cluett et al. [17] mention this satisfaction but find no significant differences.

The main limitations of this study are closely related to the existing scientific literature on this topic. Given that hydrotherapy is an innovative technique, the current knowledge on it is limited.

Additionally, the impact of publication bias was evaluated using several statistical and visual tests. The analysis included the calculation of the fail-safe N, Kendall's tau test, and Egger's regression. The fail-safe N was 48 ($p < 0.001$), indicating that 48 additional studies with null effects would be needed to render the meta-analysis results non-significant. Kendall's tau test and Egger's regression showed values suggesting a significant presence of publication bias. These results, along with the funnel plot, indicate that although the meta-analysis results are statistically significant, the magnitude of the observed effect may be influenced by publication bias. Therefore, it is crucial to interpret the results with caution and consider this potential bias when drawing conclusions.

Future research lines have emerged from this study. A project involving four hospitals in the province of Granada will study births and pain control in pregnant women, with subsequent follow-up during the postpartum period. A control group will be established to compare results.

Additionally, the possible benefits of hydrotherapy in deliveries of pregnant women diagnosed with hypermobile Ehlers–Danlos syndrome, a rare disease, will be investigated.

## 5. Conclusions

Based on the provided information from the systematic review, several conclusions can be drawn:

Hydrotherapy as a non-pharmacological method for pain relief: The systematic review suggests that hydrotherapy during labor can serve as an effective non-pharmacological method for pain relief. This implies that it could offer an alternative or complementary approach to traditional pharmacological methods, potentially reducing the need for epidurals.

Improved coping mechanisms and satisfaction: Women who utilize hydrotherapy during labor may experience an enhanced ability to cope with pain, leading to a greater sense of control, satisfaction, and comfort. These psychological benefits can contribute positively to the overall childbirth experience.

No significant impact on labor duration or newborn health: The use of hydrotherapy does not seem to affect the duration of labor or the physical condition of the newborn. This suggests that while it provides pain relief and psychological benefits, it does not interfere with the natural progression of labor or compromise the health of the newborn.

Potential reduction in instrumental deliveries and cesarean sections: Some authors suggest that hydrotherapy may even facilitate the natural completion of labor, resulting in fewer instrumental deliveries and cesarean sections. This has significant implications for addressing concerns about the increasing rates of cesarean sections and reducing interventionism in clinical practice.

Need for further research: Despite the positive findings, there is a need for further research, particularly research focusing on the use of hydrotherapy in the second stage of labor. Additionally, the lack of reported adverse neonatal outcomes in many articles contrasts with the caution expressed by some pediatric associations, highlighting the necessity for more comprehensive studies to assess safety concerns.

Importance of correct management and training: Proper management of hydrotherapy during labor involves training and updating midwives, as well as developing clinical practice protocols and guidelines that are supported by scientific evidence. This ensures

that women receive optimal care during childbirth and mitigates potential risks associated with hydrotherapy.

Overall, this systematic review suggests that hydrotherapy during labor offers promising benefits for pain relief and childbirth outcomes, but further research and proper management are necessary to fully understand its implications and ensure safe implementation.

**Supplementary Materials:** The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/jcm13113260/s1, Supplementary Material Table S1 provides the search strategies used in each of the databases and the filters applied. Supplementary Material Table S2 provides the results of the application of the PEDro scale to each of the articles included in this meta-analysis.

**Author Contributions:** Conceptualization, E.M.-G., J.C.-M., J.C.S.-G. and R.R.-B.; data curation, M.M.P.F. and J.C.S.-G.; methodology, J.C.-M., E.M.-G., B.P.-S. and L.D.-R.; investigation, R.R.-B. and B.P.-S.; resources, J.C.-M. and J.C.S.-G.; writing—original draft preparation, E.M.-G., R.R.-B. and B.P.-S.; writing—review and editing, J.C.-M., J.C.S.-G., E.M.-G., L.D.-R., M.M.P.F. and R.R.-B.; visualization, B.P.-S. and R.R.-B.; supervision, J.C.S.-G. and R.R.-B.; project administration, L.D.-R. All authors have read and agreed to the published version of the manuscript.

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**Data Availability Statement:** Data are available upon request from the corresponding author.

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# *Artículo 5:*

Mellado-García E, Díaz-Rodríguez L, Cortés-Martín J, Sánchez-García JC, Piqueras-Sola B, Higuero Macías JC, Rodríguez-Blanque R. Systematic Reviews and Synthesis without Meta-Analysis on Hydrotherapy for Pain Control in Labor. *Healthcare*. 2024; 12(3):373. https://doi.org/10.3390/healthcare12030373

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| 2023 | 73/174 | Q2 | 58.3 |

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*Systematic Review*

# Systematic Reviews and Synthesis without Meta-Analysis on Hydrotherapy for Pain Control in Labor

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**Abstract:** Background: Although there is scientific evidence regarding the use of water immersion during labor, this evidence is primarily focused on the first stage of labor. There is limited scientific evidence on water immersion during the second stage of labor. Objective: The objective of this study was to conduct a comprehensive systematic review and synthesis of contemporary evidence related to water birth, with a specific focus on the second stage of labor. Methods: A systematic review of the scientific literature published between January 2018 and October 2023 was carried out. A synthesis of the results was conducted following the Synthesis without Meta-Analysis (SWiM) guidelines. PubMed, Scopus, and the Cochrane Library were utilized as information sources. The search strategy was designed using the keywords "immersion" and "parturition", along with their relevant synonyms. Inclusion criteria encompassed studies employing randomized controlled trials (RCTs), systematic reviews, and quantitative and qualitative approaches focusing on pregnant women undergoing water immersion at any stage of the labor process. Results: Eleven articles were selected: two systematic reviews (one quantitative and one qualitative), five cohort studies, one case–control study, one cross-sectional observational study, and two qualitative studies. A thorough assessment of the methodology was performed using several specific tools: the Cochrane RoB 2 (Risk of Bias 2) tool for systematic reviews, JBI Critical Appraisal Checklist for Qualitative Research for qualitative studies, STROBE for observational descriptive studies, and CASPe for qualitative studies. The results provided fundamental insights that will contribute to conceptual standardization regarding the effects of water birth on maternal and fetal health. Additionally, a synthesis of the results was performed concerning types of delivery, analgesia use, pain perception, and maternal satisfaction with the water birth experience. Conclusions: In this study, we conclude that the results regarding delivery types, labor durations, and analgesia use found in the literature, along with statistically significant maternal/fetal effects, are crucial for making recommendations regarding the use of water during labor in any of its stages if the woman desires it safely.

**Keywords:** water immersion; labor stage; second; evidence-based medicine; pregnant women; delivery; obstetric; analgesia; pain perception



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## 1. Introduction

Numerous scientific articles have delved into water birth, seeking to provide answers to associated questions. The benefits of aquatic immersion during the initial stage of labor have been meticulously documented, supported by scientific evidence substantiating the

safety of the procedure for both the parturient and the neonate [1]. The use of birthing pools during labor offers several benefits for both the mother and the fetus. Firstly, immersion in warm water provides relief from pain and discomfort by reducing the perception of pain and relaxing the mother's muscles [2,3], thereby alleviating tension and stress. Additionally, the buoyancy of water facilitates movement and finding comfortable positions, aiding the baby's rotation and the progression of labor. Fetal flexion is improved, maximizing maternal pelvic diameters and easing the birthing process. The use of birthing pools is associated with a reduced need for epidural analgesia and other pharmacological pain relief, as well as a decrease in medical interventions such as labor induction, episiotomy, and cesarean section [4]. Many women report an increased sense of control and satisfaction during childbirth when using these pools. Furthermore, there is a lower risk of severe perineal tears and better postpartum recovery due to the relaxation provided by warm water. Regarding the fetus, no increased risks have been observed, with low rates of neonatal infection and normal Apgar scores for babies born in the water [2,4]. It is crucial to note that these benefits primarily apply to uncomplicated deliveries, and the use of birthing pools should be carried out under the appropriate supervision and care of trained healthcare professionals. Every woman and pregnancy is unique, so it is essential to discuss birthing options with the healthcare provider to make informed decisions [2]. However, it is pertinent to note that certain studies, by focusing on the first stage of labor, do not address the expulsive phase, limiting the extent and robustness of available evidence [5].

In a recent study conducted by Burns et al. [6], the conclusion was reached that there are no adverse associations in outcomes for either the mother or neonate in relation to water birth. However, the use of water immersion during labor stages does not always have unanimous support from obstetrics and gynecology institutions. While widespread acceptance of this practice prevails among professionals attending low-risk pregnancies in the United Kingdom [7], the American College of Obstetricians and Gynecologists (ACOG) in the United States focuses on the inadequacy of randomized clinical trials [8]. It is relevant to note that such research has inherent limitations, such as obtaining samples conditioned by the willingness of participating women, limited scientific production specifically on the second stage of labor, and the absence of blinding in trials [9]. Most published studies take the form of observational studies, which—by concluding in favor of benefits and questioning the harm of water birth—diverge from some current guidelines. At the same time, they propose the possibility for hospitals to implement safe water birth programs for low-risk women, in accordance with the wishes of the parturients [9].

Research has suggested a wide range of potential benefits associated with the aquatic environment. Firstly, it is relevant to highlight that the properties of water allow buoyancy and freedom of movement. Rest and activity in this medium can lead to a reduction in fear, anxiety, and pain perception during the birthing process. Working in water has been observed to optimize childbirth physiology by releasing endogenous endorphins and oxytocin [6]. Water exposure also involves coping with contractions, as the water temperature promotes maternal relaxation, concurrently reducing stress-related hormones and pain perception, resulting in lower demand for analgesia by the woman [5,10].

In the Spanish context, the current clinical practice guideline on normal birth care prescribes hot water immersion as an effective method for relieving pain during the late stage of the first stage of labor [11]. The compelling need to undertake this systematic review arises from the limited availability of information regarding water immersion during the second stage of labor. In response to a recent assessment highlighting the scarcity of specific scientific evidence in this context, the lack of conclusive data on the effects of water immersion during the expulsion phase becomes evident. The report underscores the absence of a national protocol addressing this practice specifically, emphasizing the importance of conducting a comprehensive review to better understand the associated benefits and risks. The systematic review stands as a crucial initiative to address existing gaps in the scientific literature, providing a more robust foundation for future clinical and policy decisions in this particular aspect of the childbirth process [12,13].

In light of the above, the following research question is raised: What is the current scientific evidence regarding the benefits and risks associated with water births, particularly during the second stage of the birthing process? To address the research question, the purpose of our study was to conduct a comprehensive systematic review and synthesis of contemporary evidence related to water birth, with a specific focus on the second stage of labor. Our intention is to contribute significantly to the scientific body by critically examining the benefits and risks inherent in water immersion during childbirth, as outlined in the selected scientific articles for review.

## 2. Materials and Methods

The preparation of this report followed the methodology of a systematic review using the guidelines provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [14] guidelines and the Synthesis Without Meta-Analysis (SWiM) extension [15]. The review focused on scientific literature published from January 2018 to October 2023. The present systematic review was conducted according to a specific protocol, which is available on the website: http://www.crd.york.ac.uk, accessed on 10 March 2023, under the registration number CRD42023399625.

### *2.1. Eligibility Criteria*

We included articles utilizing systematic review methodologies, along with quantitative and qualitative studies concentrating on pregnant women undergoing water immersion at any phase of the childbirth process. No language restrictions were applied during the selection process.

### *2.2. Information Sources*

The bibliographic inquiry was conducted in the Scopus, PubMed, and Cochrane Library databases. The structuring of the search language was based on Medical Subject Headings (MeSH) terms and Health Science Descriptors (DeCS). The descriptors used were "immersion" and "parturition", employing the Boolean operators AND and OR to refine and expand the search, respectively.

### *2.3. Search Strategy*

In Table 1, the search strategy employed for the execution of this research in each of the consulted databases is displayed. The precise date on which this search was conducted is included, thus providing a detailed description of the methodology used in the information-gathering process.

**Table 1.** Search Strategy.

| Source | Search String | Limits | Search Date |
| --- | --- | --- | --- |
| SCOPUS | (TITLE-ABS-KEY (immersion OR "Immersions" OR "Submersion" OR "Submersions") AND TITLE-ABS-KEY (parturition OR "Parturitions" OR "Birth" OR "Births" OR "Childbirth" OR "Childbirths") AND TITLE-ABS-KEY (pregnant AND women)) | - | 1 to 15 November 2023 |
| PUBMED | ((immersion[MeSH Terms]) OR ("Immersions" OR "Submersion" OR "Submersions") AND ((y_5[Filter]) AND (humans[Filter]) AND (female[Filter]) AND (alladult[Filter] OR youngadult[Filter] OR adult[Filter] OR middleagedaged[Filter]))) | Humans<br>Female<br>Adult | 5 to 25 November 2023 |
| COCHRANE LIBRARY | #1: MeSH descriptor: [Immersion] explode all trees<br>#2: MeSH descriptor: [Parturition] explode all trees<br>#1 AND #2 Filter: Clinical Trials | Clinical trials | 20 November 2023 |

### *2.4. Data Extraction Process*

Following the execution of the search strategy, the identified articles were transferred to the Mendeley web platform using the Mendeley Web Importer tool. Subsequently, the

documents were organized into folders and classified according to the original database, followed by the removal of duplicates.

The studies considered for inclusion in this analysis encompassed systematic reviews as well as quantitative and qualitative studies, with the aim of evaluating the effects of water birth on maternal–fetal health published between January 2018 and October 2023. Two reviewers (E.M.-G. and J.C.-M.) independently conducted the review of the title, abstract, and keywords of each study identified in the search, applying inclusion and exclusion criteria. For those potentially eligible studies, the same procedure was applied to the full-text articles. Discrepancies between reviewers were resolved through discussion or if necessary by a third reviewer (J.C.S.-G.).

The collection of data related to quality, patient characteristics, interventions, and relevant outcomes was independently carried out by two different reviewers (R.R.-B. and B.P.-S.).

### 2.5. Data Collection Process and Collected Data

Two evaluators, identified by their initials, conducted data extraction for each included article, addressing aspects such as authors, article type, participants, objectives, interventions, measurement instruments, key findings, and conclusions. The selection of studies used in the results was independently performed by two researchers (E.M.-G. and J.C.-M.) through the review of titles and abstracts. In this process, the decision was made to select studies that—in addition to meeting the inclusion criteria—provided recent and conclusive evidence regarding water birth and its maternal–fetal outcomes.

Additionally, an evaluation of the strengths and weaknesses inherent to each study was carried out focusing on the primary outcome, i.e., the use of water during childbirth compared to women who experienced conventional delivery, expressed, for example, in terms of the type of delivery (percentage).

In the Results section, the article selection process is explained in detail. Studies that did not meet the inclusion criteria or presented inconclusive evidence were excluded from the results.

### 2.6. Risk of Bias in Individual Studies

To conduct the methodological assessment of the articles included in this study, a comprehensive analysis of the design, methodology, and study type of each work was undertaken to select the most appropriate methodological evaluation scale for each case.

The risk of bias in the systematic review was assessed using the RoB 2 (Risk of Bias 2) tool [16].

For the qualitative systematic review, the JBI Critical Appraisal Checklist for Qualitative Research [17] was employed, recommended for meta-aggregative reviews. Developed by the Joanna Briggs Institute for critical and interpretive research, this checklist consists of 10 questions with response options: “yes”, “no”, “unclear”, or “not applicable”.

Descriptive observational studies underwent methodological quality assessment using the STROBE checklist [18]. This statement, consisting of 22 points, ensures that studies meet all necessary elements for quality in a descriptive article. The 22 items are organized into seven classic sections (IMRD: Introduction, Methods, Results, Discussion), with two preceding sections (title and abstract) and one following (funding). For qualitative studies, the CASPe critical appraisal tool [19] was utilized, enabling the assessment of the quality of a qualitative study in three respects: rigor, credibility, and relevance. It comprises 10 questions with three possible responses: “yes”, “no”, or “unclear”.

### 2.7. Results Synthesis

The methodological characteristics of each study (such as study designs, intervention types, or outcomes) were too diverse to produce a meaningful summary estimate of effect, so the SWiM guidelines were used for the synthesis of the selected articles [15].

Considering the information gathered in this review, results emerge that provide a set of fundamental premises. These premises are outlined as key elements to standardize

concepts related to the effects of water birth on both maternal and fetal health. Furthermore, a synthesis of the results is achieved, encompassing aspects such as types of delivery, analgesia use, duration of labor, maternal outcomes, neonatal outcomes and pain perception associated with the water birth experience.

## 3. Results

The collected information provides essential premises to standardize concepts regarding the impacts of water birth on maternal and fetal health. The synthesis covers key aspects, such as types of delivery, analgesia use, pain perception, and maternal satisfaction, consolidating the understanding of results derived from heterogeneous studies.

Throughout the review, a total of 11 studies employing various research methodologies were identified. These comprised two systematic reviews (one quantitative and one qualitative in nature), five cohort studies, one case–control study, one cross-sectional observational study, and two qualitative investigations. The inclusion of this variety of methodologies allowed for a comprehensive approach to different variables related to water birth.

The obtained results exhibited variability among the studies, reflecting notable differences in the presented evidence. This variability is attributed to the diversity in the methodological approaches employed, as well as the specific objectives pursued by each study.

Figure 1 depicts the flowchart of the article selection process in this systematic review.

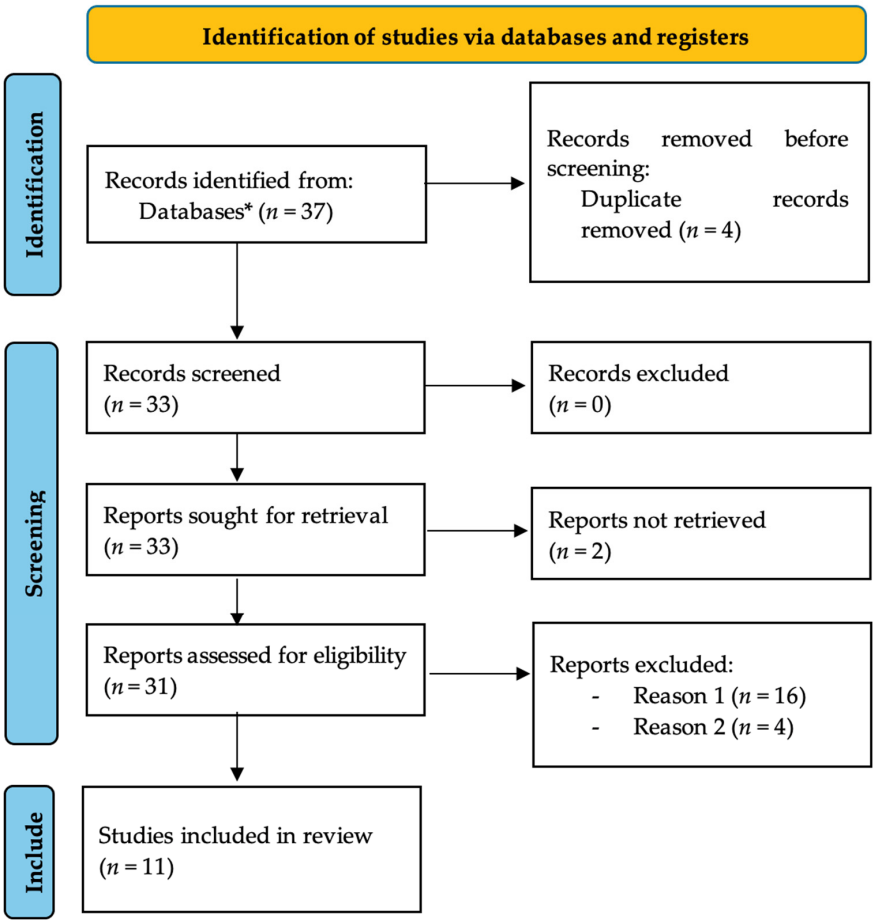


**Figure 1.** Flow diagram. * Out of the 37 articles, 9 were from PubMed, 26 from Scopus, and 4 from the Cochrane Library.

The risk-of-bias assessment of the articles yielded the following results. The review by Cluett et al. (2018) [5] generally appears to have a low risk of bias. The primary sources of bias arise from the scarcity of data (limited statistical power) rather than from methodological

issues or difficulties in presenting results. The outcomes of the methodological quality analysis following the STROBE checklist were not lower than 13 (Czech et al. (2018) [20]), while the remaining studies exhibited a low risk of bias, scoring between 17 and 20 points. Regarding studies employing qualitative methodology [21,22], both displayed a low risk of bias.

Table 2 shows the summary of the results according to the SWiM guidelines.

**Table 2.** Summary of results according to the SWiM guidelines.

| Article | Benefits | Risks |
| --- | --- | --- |
| Cluett et al. (2018) [5] | 1. Decrease in the use of analgesia during the first stage of labor (dilating period). 2. Shorter duration of the first stage of labor. 3. Better level of maternal satisfaction in the expulsive period in water. | 1. Isolated cases of sepsis (a severe infection) have been reported in the newborn, and also maternal cases due to *Pseudomonas aeruginosa*, difficulty in thermoregulation, hypovolemic shock, hyponatremia, respiratory difficulty and hypoxic–ischemic encephalopathy, resulting in some lethal cases. Given the limitations of many studies, it is difficult to establish the incidence of complications. |
| Reviriego-Rodrigo et al. (2023) [23] | 1. Pain relief. 2. Feeling of control. 3. Feeling of relaxation. 4. Improved mobility. 5. Improved satisfaction. | 1. Concerns about the baby's safety. 2. Concerns about water hygiene. 3. Concerns about the ability of professionals to detect and manage complications. |
| Ibanoglu et al. (2022) [24] | 1. Decreased pain. 2. Reduction in the need for epidural analgesia. | No significant risks were reported. |
| Camargo et al. (2018) [25] | No significant benefits were reported. | No significant risks were reported. |
| Ulfsdottir et al. (2019) [26] | 1. Pain relief. 2. Feeling of control. 3. Feeling of relaxation. 4. Improved mobility. 5. Improved satisfaction. | No significant risks were reported. |
| Barry et al. (2020) [27] | 1. Less need for epidural analgesia. 2. Greater maternal satisfaction. | No significant risks were reported. |
| Czech et al. (2018) [20] | No significant benefits were reported. | No significant risks were reported. |
| Neiman et al. (2020) [21] | 1. Less need for epidural analgesia. 2. Shorter duration of labor. 3. Lower episiotomy rate. | No significant risks were reported. |
| Uzunlar et al. (2021) [28] | No significant benefits were reported. | No significant risks were reported. |
| Dado et al. (2022) [29] | 1. Pain relief. 2. Feeling of control. 3. Feeling of relaxation. 4. Improved mobility. 5. Improved satisfaction. | No significant risks were reported. |
| Carlsson et al. (2020) [30] | 1. Pain reduction. 2. Greater maternal satisfaction. | 1. Concerns about the baby's safety. 2. Concerns about water hygiene. 3. Concerns about the ability of professionals to detect and manage complications. |

Table 3 summarizes various studies related to water birth or immersion during labor. The main objectives addressed were to assess the effects of water on the delivery method, pain levels, oxidative stress in newborns, women's experiences, and maternal/neonatal outcomes. The results show that water can reduce the need for analgesia, decrease pain, and increase relaxation and the perception of control during childbirth. It does not seem to affect delivery methods or increase risks for mothers or babies. Lower oxidative stress was reported in newborns from the water group. Women's experiences were mostly positive, highlighting both physical and emotional benefits. Some expressed fears or complications, mainly associated with infrastructure. On the other hand, many received limited information about the water option. The examined studies showed good maternal and neonatal outcomes after water birth or immersion, with no differences compared to standard care and even some advantages, such as less pain and greater satisfaction. In general, the summarized research concludes that water birth or immersion appears to be a safe and effective alternative to enhance the experience for many women. However, there is a need to strengthen information processes and care protocols.

**Table 3.** Selected articles for the systematic review [5,23–29].

| Authors | Type | Objectives | Outcomes | Punch line |
| --- | --- | --- | --- | --- |
| Cluett et al. (2018) [5] | Systematic Review. | Assessing the effects of water immersion during labor and/or delivery (first, second, and third stages of labor) on women and their infants. | Comparing water immersion at any stage of labor, no clear differences were found in type of delivery, blood loss, or neonatal complications. Fewer women in the immersion group received an epidural, with no differences in ICU admission, neonatal infections, type of delivery, or mortality. Maternal satisfaction was higher in the water immersion group during the second stage of labor. | Labor in water may reduce the need for an epidural. This review found no evidence that water birth increases the risk of adverse outcomes for women or their newborns. |
| Dado et al. (2022) [29] | Qualitative study | Its primary aim is to comprehend realities through personal experiences, feelings, and individuals' perspectives. | The women in this study described it positively and it was strongly associated with women's perception of having the ability to trust their instincts, facilitated by the soothing effect of the water. All women in the study described the birth of their babies as a positive birth experience. Few women were informed about the option of using the pool during the prenatal period. | Improving the implementation of waterbirth as a care option for women in Ireland. Contributes to increased maternal and family satisfaction, and improves the quality of care and overall birth experience for women. |
| Carlsson et al. (2020) [30] | Qualitative study | Explore retrospective accounts of benefits, negative experiences, and preparatory information related to water births. | Physical benefits were highlighted as facilitating labor progression, buoyancy and pain relief; psychological benefits as greater relaxation and control in a nonmedicalized and safe environment. Negative experiences were identified as (a) equipment-related problems due to tub construction and problems associated with water immersion, and (b) fears and concerns related to water birth. Lack of general and specific information about water births was reflected. | The lack of adequate equipment in Swedish maternity units underlines the need to question the current routines and resources in Swedish maternity units to better adapt them to the needs of pregnant women. |
| Uzunlar et al. (2021) [28] | Prospective Cohort Study | Investigate the cord blood level of copeptin, total serum oxidant (TOS), antioxidant (TAS), interleukin (IL)-1, IL-6, and oxytocin levels following labor with water immersion, epidural analgesia, and vaginal delivery without pain relief. | There were no statistically significant differences between the three groups for duration of the first and second stages of labor, total duration of labor, labor intervention rate, the presence of perineal trauma and lactation status. APGAR scores at 1 and 5 min were significantly lower in group 2 compared to groups 1 and 3. TAS, TOS and copeptin levels were significantly higher in the epidural group than in the control and water groups. The need for admission to the neonatal intensive care unit (NICU) was significantly higher in the epidural group ($p = 0.011$), with rates of 3.3%, 20%, and 2.3% in groups 1, 2, and 3, respectively. | Epidural analgesia is associated with elevated levels of oxidants and antioxidants, as well as less satisfactory neonatal outcomes compared to conventional water birth. |

**Table 3.** *Cont.*

| Authors | Type | Objectives | Outcomes | Punch line |
| --- | --- | --- | --- | --- |
| Reviriego-Rodrigo et al. (2023) [23] | Systematic review and thematic synthesis of qualitative evidence were conducted. | Investigate the experiences of women and midwives with water immersion during labor. | The reasons for choosing waterbirth are prior knowledge of positive experiences, recommendations, seeking relaxation and anxiety reduction, feeling of comfort and well-being, desire for natural childbirth and pain relief. The advantages of waterbirth include a lower likelihood of perineal tearing, a shorter active phase of labor, no increased risk of neonatal mortality compared to conventional delivery, no adverse effect on the newborn's general condition (Apgar score) and no increased risk of infection for the newborn. | The findings underscore the feasibility and efficacy of water immersion as a safe option during childbirth, and highlight the importance of adequate resources and rigorous protocols, backed by a culture of support for this practice by midwives. |
| Ibanoglu et al. [24] | Case–control study. | Compare the levels of myeloperoxidase (MPO) in umbilical cord blood samples from mothers undergoing water immersion versus conventional labor. | The mean duration of the first stage of labor was shorter in the water immersion group, as was the visual analogue scale (VAS) pain score of 7 vs. 9. Myeloperoxidase (MPO) values were significantly lower in the water immersion group than in the control group ($p = 0.004$). | The findings of this study demonstrate that labor pain can be effectively reduced through water immersion during the first stage of labor. Regarded as an analgesic method, it is a convenient and comfortable approach that does not entail complications associated with anesthesia and does not require the involvement of an anesthesiologist. |
| Camargo et al. (2018) [25] | Cross-sectional and observational quantitative study of women in water immersion, noncomparative. | Analyze the maternal and neonatal outcomes of 90 low-risk pregnant women who gave birth in the water at São Bernardo Hospital. | Apgar scores were greater than 7, 93.7% of the women showered for nonpharmacologic pain relief, and 94.3% had no desire to leave the pool. Only 1.1% requested pharmacologic measures for pain relief. There was a decrease in cervical dilatation time and a shorter duration of the expulsion phase. Regarding neonatal outcomes, 97% maintained a normal fetal heart rate (between 110 and 160 beats per minute) during maternal immersion. | Water birth was satisfactory and safe for the women/couples and newborns. There were no negative effects on neonatal outcomes. On maternal outcomes, immersion influenced the duration of labor and was a crucial element in pain relief due to its relaxing effects and the freedom of movement and positions it allowed. |
| Ulfsdottir et al. (2019) [26] | Prospective cohort study | Compare the childbirth experiences between women who had a water birth and those who had a conventional, uncomplicated delivery. | Women who had water births scored significantly higher in the "Self-capacity" domain and lower in the "Professional support" domain. They reported less pain and higher control scores during the second stage of labor. These women felt less dependent on the midwife. | Overall, waterbirth appears to empower women, enhancing their experience and possibly reducing their need for midwifery assistance. |

**Table 3.** *Cont.*

| Authors | Type | Objectives | Outcomes | Punch line |
| --- | --- | --- | --- | --- |
| Barry et al. (2020) [27] | Prospective cohort study | Examine childbirth outcomes for women and babies after water immersion solely for labor or for both labor and delivery. | Water immersion during childbirth was associated with more spontaneous vaginal deliveries and less use of epidurals, but also with a slight increase in the risk of postpartum hemorrhage. Women who chose water immersion more frequently experienced babies with higher birth weight, but there were no significant differences in adverse neonatal outcomes. Additionally, initiation and exclusivity of breastfeeding were higher in this group. | Water immersion appears to be a safe alternative for low-risk women and is rated very positively by women in terms of birth experience. |
| Czech et al. (2018) [20] | Prospective cohort study | Assess the effectiveness of both pharmacological and nonpharmacological pain relief methods and compare their outcomes. | There were no statistically significant differences in childbirth pain levels between women who attended parent education classes and those who did not. Perineal massage did not reduce the frequency of perineal incisions, and episiotomy did not impact pain intensity in the study participants. Among those who underwent episiotomy, the majority were nulliparous. No significant pain level differences were noted between epidural and gas analgesia groups in the first stage of labor, but epidural analgesia effectively reduced pain during the second and third stages. Water immersion yielded the highest satisfaction levels. | Water birth did not show a statistically significant reduction in pain intensity, but it was well-received and associated with the highest satisfaction among women. Water immersion remains the most accepted non-pharmacological pain relief option, unlike TENS, which was associated with the lowest satisfaction level in the study. |
| Neiman et al. (2020) [21] | Prospective cohort study | Generate evidence regarding maternal and neonatal outcomes associated with water immersion during labor and delivery. | Water birth did not show significant risks for newborns, and mothers who chose water birth reported high satisfaction. However, a higher incidence of postpartum hemorrhage was observed in this group, despite a reduction in the duration of the early stages of labor. These findings emphasize the importance of weighing the benefits and risks of water birth, as well as the necessity for proper training for perinatal care professionals in various settings. | This study adds to the existing evidence on the risks and benefits of water birth for women and newborns, emphasizing the importance of proper training for perinatal care providers handling births in various settings. |

## 4. Discussion

This review has been conducted to investigate the effects of water immersion at various stages of the childbirth process, focusing on maternal and fetal/neonatal outcomes, as well as identifying its influence on the mode of delivery. The practice of water birth has been the subject of study for over four decades in multiple countries, enabling the compilation of significant results within the scope of this review.

Throughout the review, a total of 11 studies employing various research methodologies were identified. These comprised two systematic reviews (one quantitative and one qualitative in nature), five cohort studies, one case–control study, one cross-sectional observational study, and two qualitative investigations. The inclusion of this variety of methodologies allowed for a comprehensive approach to different aspects related to water birth.

The obtained results exhibited variability among the studies, reflecting notable differences in the presented evidence. This variability is attributed to the diversity in the employed methodological approaches, as well as the specific objectives pursued by each study. The assessment of results emerges as a complex process in which the nature of the research and its specific goals influence the interpretation of the effects of water immersion in various dimensions of childbirth.

### *4.1. Types of Delivery*

Three specific studies [27,28] in the present analysis addressed the incidence of different types of delivery, observing no statistically significant differences between the groups that underwent water birth and those who opted for conventional methods. This conclusion aligns with the findings of the systematic review by Cluett et al. [5], which examined a total of 15 trials, of which 8 were considered and evaluated. Across these 8 trials, covering a total population of 3663 subjects, no substantial differences were evidenced between the groups regarding various modes of delivery, whether spontaneous vaginal, instrumental, or cesarean.

This pattern of results suggests consistency in the reviewed literature, indicating a lack of significant differences in outcomes related to types of delivery between those who underwent water immersion during the childbirth process and those who did not. The alignment of these results with the systematic review by Cluett et al. [5] strengthens the coherence and robustness of the evidence gathered on this specific theme.

### *4.2. Use of Analgesia*

During the first stage of labor, the systematic review conducted by Cluett et al. [5] reveals a discrepancy in the use of epidural analgesia between women who opted for water immersion and those who did not. According to this study, in the group of women who experienced water birth, a lower proportion received epidural analgesia compared to the groups that did not use water. However, no significant differences were identified in the use of epidural analgesia or the use of pethidine/narcotics between the groups.

On the other hand, Barry et al. [27] present contrasting findings regarding the administration of analgesia during the first stage of labor. According to this study, women who participated in the water immersion group showed a lower likelihood of using epidural analgesia compared to those in the control group who did not use water immersion. The observed difference was substantial, with a significantly less epidural analgesia use in the water immersion group (15.9%) compared to the control group (48.9%).

This discrepancy between studies highlights the variability in results and suggests that the relationship between water immersion during the first stage of labor and the use of epidural analgesia may depend on multiple factors, including specific care protocols and characteristics of the studied population. Addressing these differences is necessary to fully understand the influence of water immersion on decisions related to analgesia during the first stage of labor.

### *4.3. Duration of Labor*

The present review of studies, which assessed the duration of the childbirth process through specific investigations [22,24,28], has concluded that there are no statistically

significant differences in the overall duration of labor between the groups that used water immersion and those that did not. This consistency in results suggests that water immersion may not have a substantial impact on the total duration of the childbirth process according to the parameters evaluated in the selected studies.

However, it is pertinent to note that there are studies highlighting the potential positive influence of water immersion on the duration of labor through its relaxing effects. In particular, studies like that of Cluett et al. [5] and other research have underscored the relaxing nature of water and its potential to reduce the duration of labor.

In contrast, a prospective study evaluating myeloperoxidase levels during water immersion [24] did not identify statistically significant differences in the total duration of labor. However, it was observed that the average duration of the first stage of labor was shorter in the water immersion group. This observation was supported by other studies, such as those by Neiman et al. [21] and Ulfsdottir et al. [26], who reported that women in the water birth group experienced a shorter duration of the first and second stages of labor.

The interpretation of these results suggests that the possible presence of favorable conditions during water birth that could counteract stress and tension, potentially facilitating the progress of labor. This approach could be considered a significant aspect to explore in future research on the effects of water immersion during the childbirth process [31].

### 4.4. Maternal Outcomes

The analyzed studies, particularly those included in the systematic review by Cluett et al. [5], have consistently concluded that there is insufficient evidence to establish significant differences in third and fourth-degree tears associated with water birth. This finding highlights the lack of conclusive evidence regarding the influence of water immersion on the incidence of higher-grade tears during the childbirth process.

Regarding specific research on tears [25], some detailed studies have not found statistically significant differences between the groups that used water immersion and those that did not [27,28]. This lack of difference in tear incidence suggests that the practice of water birth does not appear to be associated with a significant increase in vulnerability to this type of injury.

As for postpartum hemorrhage, the results of the reviewed studies also point to the absence of significant differences between the groups that opted for water immersion and those that did not. Specific investigations [26,27] have not found statistically significant differences in postpartum blood loss between the two groups. Similarly, the systematic review by Cluett et al. [5] concludes that there is insufficient evidence to determine the effect of water immersion on postpartum blood loss.

These findings indicate the need for a more detailed and rigorous evaluation of the available evidence, as well as the importance of future research to address more specifically and conclusively the potential effects of water immersion on outcomes such as tears and postpartum hemorrhage during the childbirth process.

### 4.5. Neonatal Outcomes

In the analysis of neonatal events recorded in the reviewed studies, the results of our systematic review indicate that no statistically significant differences were found between the groups of women who used water immersion during childbirth and those who opted for conventional methods. The studies referenced as [5,27,28] support this conclusion by not observing significant disparities in the evaluated neonatal events.

Eckert et al. [22] notes a higher use of resuscitation in the group of neonates born to women who used water immersion, although it emphasizes that increased neonatal infectious morbidity has not been associated with bath use. Additionally, Apgar scores show no significant differences between the groups. On the other hand, the study by Uzunlar et al. [28] reveals that epidural analgesia impaired oxidative stress status and reduced neonatal Apgar scores, resulting in a higher admission rate to the Neonatal Intensive Care Unit (NICU) for neonates whose mothers used epidural analgesia. This study, comparing three groups (the water-use group, the non-water-use and no analgesia

group, and the epidural analgesia-use group), identified statistically significant differences in NICU admissions for neonates whose mothers used epidural analgesia during childbirth.

According to Ulfsdottir et al. [26], no differences were observed in Apgar scores between the groups, and none of the neonates in the conventional childbirth group were transferred to the NICU, while none of the neonates in the water birth group required NICU transfer.

Cluett et al. [5] reports on perinatal death, admission to the neonatal intensive care unit, and neonatal infection, concluding that the reviewed studies do not show clear differences between the groups in these outcomes.

Overall, these results suggest that in general, water immersion during childbirth does not seem to be associated with significant differences in neonatal events, although some studies highlight specific aspects that may require more detailed consideration in future research.

### *4.6. Pain and Childbirth Experience*

Immersion in warm water during childbirth has been associated with a relaxing effect that facilitates neurohormonal interactions, relieves pain, and optimizes the progression of labor [32]. This effect is attributed to the reduction of sensory stimulation, decreasing the likelihood of stress hormone secretion [25], revealing that women who used hydrotherapy during labor experienced pain relief, avoiding the need for analgesia. It suggests that water immersion can be an effective nonpharmacological method for pain relief during childbirth [25,32].

Regarding the relationship between water birth and pain reduction, some results from our review do not support the statistical association between water birth or water immersion and a significant decrease in pain severity [20]. In a randomized controlled trial conducted by Eckert et al. [22], measurements of mean scores for the experienced pain impression and appropriateness of pain relief at 24 and 48 h, as well as 8 months after childbirth, showed no significant differences between water birth and conventional childbirth groups.

Pain relief has been qualitatively explored as one of the physical benefits of water immersion during childbirth. According to surveys, many women described water as soothing for the vulva and perineum during the second stage of labor, highlighting improvement in the pain experience and its decrease between contractions.

Pain management is linked to childbirth experiences, and qualitative studies have addressed various topics related to water birth [23,29,30]. Qualitative evidence suggests that women giving birth in water perceive having more control and empowerment by not using pharmacological analgesia, thus achieving positive childbirth experiences [24]. Other qualitative studies, such as Dado et al. [29], positively describe the water birth experience, strongly linking it to women's ability to follow their instincts. Additionally, research like Carlsson et al. [30] concludes that women giving birth in water experience physical and psychological benefits, but highlights the need for better equipment and sufficient information both prenatally and during childbirth. Authors like Reviriego-Rodrigo et al. [23] emphasize the perspective of midwives, concluding that water births must be safely ensured, with adequate resources and training for midwives, along with the implementation of standardized protocols to allow all pregnant women to safely choose water use during childbirth with satisfactory results.

### *4.7. Implications for Clinical Practice*

According to the analyzed documentation, the following recommendations are proposed for the clinical practice of healthcare professionals.

- Provide comprehensive information about the potential benefits and risks of water birth to all pregnant women.
- Equip birthing facilities with suitable facilities and equipment to conduct safe water births (birthing tubs, water heaters, etc.).

- Establish protocols that enable healthcare personnel to determine low-risk criteria for opting for this alternative (maternal and fetal health status, gestational week, fetal position, etc.).
- Develop consensus birth plans between the medical team and the pregnant woman addressing potential scenarios and when to resort to other options.
- Standardize the entry into the birthing pool as closely as possible to the onset of active labor to maximize its analgesic benefits, considering the possibility of delivering outside the water in cases of complications or exhaustion during labor.
- Establish means of continuous support and accompaniment by trained personnel throughout immersion and childbirth.

## 5. Conclusions

The growing demand among women to undergo water birth highlights the importance of ensuring optimal human resources and infrastructure to guarantee the safety of both the mother and the baby, supported by scientific evidence. Findings from a literature review suggest that such variables as the type of delivery, duration of labor, and analgesia usage are crucial for making recommendations on the safe use of water during childbirth. While water immersion may offer benefits, it is emphasized that secure implementation necessitates appropriate conditions, resources, and training, underscoring the significance of providing women with the option of this practice.

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**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Data are available on request from the corresponding author.

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# *IMPACTO*

## *Difusión*

Publicaciones y congresos

Título: Revisión bibliográfica sobre el uso actual de la hidroterapia durante el parto.

Autora: Mellado García, E

VIII Congreso Internacional Virtual Iberoamericano de Enfermería, 2021.

Título: Cuidados de la gestante durante el parto con inmersión en agua.

Autora: Mellado García, E

I Congreso Internacional Multidisciplinar de Innovación e Investigación en Hábitos Saludables Y VI Jornadas Enfermeras de FCCSS Ceuta, 2022.

Título: Uso de la hidroterapia durante el parto en mujeres a término.

Autores: Mellado García, E; Flores García, M; Higuero Macías, J.C; Rodríguez Blanque,R.

XVIII Congreso de la Federación de Asociaciones de Matronas de España y IV Congreso de la Asociación Andaluza de Matronas, 2019.

Título: Procedimiento De Evacuación De Emergencia De Una Embarazada De La Piscina O Bañera De Dilatación Y/O Parto

Autores: Flores García, M; Mellado García, E.

XIX Congreso de la Federación de Asociaciones de Matronas de España y I Congreso de la Asociación de Matronas de la Rioja, 2021.

Título: ¿Cómo afecta el parto en agua a los recién nacidos? Una revisión bibliográfica.

Autores: Mellado García, E; Flores García, M; Bueno Ferrer, E.

XXI Congreso de la Federación de Asociaciones de Matronas de España y II La Associació Balear de Comares, 2023.

Título: Actualizaciones en el alivio del dolor durante el trabajo de parto.

Comisión de Formación Continuada La Rioja con el nº de Expediente CFC-433-2019 con 1,72 créditos, 2020.

Título: Gestión mental del dolor aplicada al parto.

Colegio de Enfermería de Málaga con un total de 2,95 créditos.

Título: Ingresos por intento de suicidio en el Hospital Clínico San Cecilio de Granada, años 2019-2023.

Autores: Juan Carlos Sánchez García, Raquel Rodríguez Blanque, Winona Reina Bolle, Jonathan Cortés Martín, Beatriz Piqueras Sola, Elena Mellado García

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Autores: Juan Carlos Sánchez García, Raquel Rodríguez Blanque, Inés Saraceno López Palop, Jonathan Cortés Martín, Beatriz Piqueras Sola, Elena Mellado García

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Título: Physical Therapies in the Treatment of Post-COVID Syndrome: A Systematic Review

Autores: Juan Carlos Sánchez-García, María Rentero Moreno, Beatriz Piqueras-Sola, Jonathan Cortés-Martín, Antonio Liñán-González, Elena Mellado-García and Raquel Rodríguez-Blanque.

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# *Aplicación en la práctica*

La integración de la hidroterapia como opción en la asistencia al parto requiere un enfoque estructurado y basado en la evidencia. La creación de una guía de práctica clínica específica asegurará que esta técnica se aplique de manera segura y efectiva a nivel nacional, proporcionando una experiencia de parto más humanizada y menos medicalizada, alineada con las necesidades y preferencias de las gestantes.

La disponibilidad de recursos apropiados, la implementación de protocolos específicos, la capacitación especializada y el respaldo integral de todos los profesionales involucrados en el proceso del parto podrían conducir al establecimiento de una regulación legal uniforme a nivel nacional. Esta uniformidad normativa permitiría establecer procedimientos claros y estandarizados, lo que contribuiría a garantizar la seguridad y la calidad de la atención durante el parto.

# *Aportaciones en investigación.*

Enfermería Clínica

# Comparación de Duchas Terapéuticas y Bañeras para el Manejo del Dolor y Resultados del Parto: Perspectivas e Implicaciones

--Manuscript Draft--

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Editor-in-Chief
Enfermería Clínica

Dear Editor,

Subject: Submission of a Letter to the Editor

We are pleased to submit our letter to the editor titled "Comparison of Therapeutic Showers and Bathtubs for Pain Management and Birth Outcomes: A Retrospective Cohort Study" for consideration in [Journal Name]. Our letter presents a comparative analysis of our recent study findings with those of a previously published study on hydrotherapy during labor.

Our study examined the effectiveness of therapeutic showers and bathtubs in pain management and their impact on labor outcomes. We found notable differences in pain reduction, labor duration, and maternal and neonatal outcomes between the two methods. Our results suggest that therapeutic showers may offer additional benefits, such as shorter labor duration and a lower incidence of perineal tears and episiotomies.

We believe that our findings contribute valuable insights to the ongoing discussion about non-pharmacological pain management methods during labor. We hope that our letter will stimulate further research and inform clinical practice in this important area.

Thank you for considering our submission. We look forward to your positive response.

Sincerely,

Juan Carlos Sánchez-García
Professor
University of Granada
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# Comparison of Therapeutic Showers and Bathtubs for Pain Management and Birth Outcomes: Insights and Implications

**Elena Mellado-García [1], Lourdes Díaz-Rodríguez [1], Jonathan Cortés-Martín [1], Juan Carlos Sánchez-García [1,*], Beatriz Piqueras-Sola [2], Raquel Rodríguez-Blanque [1,3]**

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# Comparison of Therapeutic Showers and Bathtubs for Pain Management and Birth Outcomes: Insights and Implications

Comparación entre duchas terapéuticas y bañeras para el manejo del dolor y los resultados del parto: Perspectivas e implicaciones

Dear Editor of Enfermería Clínica,

We are writing to present a comparison between the results of our recent study "Comparative analysis of therapeutic showers and bathtubs for pain management and birth outcomes - A retrospective cohort study" and the findings of the previously published study on hydrotherapy during labor [1]. Our objective is to complement the study by Mallen Pérez et al. with the results obtained from our research.

Hydrotherapy is a technique used during labor that offers numerous benefits for pregnant women [2]. Immersing in warm water can reduce pain perception, decrease the need for pharmacological analgesia, and promote muscle relaxation, thus facilitating labor progress. Studies have shown that women who use hydrotherapy during labor report greater satisfaction with the birth experience and lower levels of anxiety [3]. Additionally, the buoyancy of the water helps to relieve pressure on the abdomen and spine, providing a sense of relief and comfort [4,5].

## Comparison of Pain Reduction

Both studies agreed that hydrotherapy, in the form of therapeutic showers and bathtubs, is effective in reducing the perception of pain during labor. Our study found that the bathtub significantly reduces pain intensity more than the therapeutic shower, with a median decrease in visual analog scale (VAS) from 7 (IQR 7-8) to 5 (IQR 4-7) for the bathtub, compared to a reduction from 8 (IQR 7-9) to 7.5 (IQR 6.25-8.75) for the therapeutic shower. This difference in pain reduction was statistically significant for the bathtub (p=0.003) but not for the therapeutic shower (p=0.083).

## Duration of Labor

Regarding the duration of labor, our study revealed that women who used the therapeutic shower had a shorter total labor time compared to those who used the bathtub. The median total labor time was 155 minutes (IQR 96.25-242.5) for the therapeutic shower and 227.5 minutes (IQR 141.25-403.75) for the bathtub, with significant differences in dilation time (p=0.002) and total labor time (p=0.004). These results suggest that the therapeutic shower may offer additional benefits in terms of reducing labor duration.

## Use of Analgesia

Both studies indicate that most women did not use epidural analgesia during labor. In our study, 79.8% of the women did not require epidural analgesia, with

no significant differences between the therapeutic shower and bathtub groups (p=0.521). This suggests that both hydrotherapy methods can be effective in minimizing the need for epidural analgesia.

**Neonatal and Maternal Outcomes**

Regarding neonatal outcomes, no significant differences were found in APGAR scores or neonatal unit admission rates between the therapeutic shower and bathtub groups. Maternal outcomes showed a lower incidence of perineal tears and episiotomies in the therapeutic shower group, which could indicate an additional benefit of this method.

In conclusion, both therapeutic showers and bathtubs are viable and effective options for non-pharmacological pain management during labor. However, our study suggests that therapeutic showers may offer additional benefits in terms of reducing labor duration and lower incidence of perineal tears and episiotomies. These findings can be highly useful for clinical practice and decision-making in labor care.

We appreciate the opportunity to contribute to the scientific discussion on this important topic and are available for any further inquiries.


1. Mallen-Perez L., Roé-Justiniano MT., Colomé Ochoa N., Ferre Colomat A., Palacio M., Terré-Rull C. Uso de hidroterapia durante el parto: evaluación del dolor, uso de analgesia y seguridad neonatal. Enferm Clin. 2018;28(5):309-15, doi: 10.1016/j.enfcli.2017.10.004.
2. Shaw-Battista J. Systematic Review of Hydrotherapy Research. Journal of Perinatal & Neonatal Nursing. 2017;31(4):303-16, doi: 10.1097/JPN.0000000000000260.
3. Schitter AM., Fleckenstein J., Frei P., Taeymans J., Kurpiers N., Radlinger L. Applications, indications, and effects of passive hydrotherapy WATSU (WaterShiatsu)—A systematic review and meta-analysis. PLoS One. 2020;15(3):e0229705, doi: 10.1371/journal.pone.0229705.
4. Benfield RD. Hydrotherapy in Labor. Journal of Nursing Scholarship. 2002;34(4):347-52, doi: 10.1111/j.1547-5069.2002.00347.x.
5. Rush J., Burlock S., Lambert K., Loosley-Millman M., Hutchison B., Enkin M. The Effects of Whirlpool Baths in Labor: A Randomized, Controlled Trial. Birth. 1996;23(3):136-43, doi: 10.1111/j.1523-536X.1996.tb00474.x.

# *Líneas de investigación futuras*

Se está trabajando en diferentes líneas de investigación que abrirán puertas de nuevo conocimiento. La integración de la hidroterapia como una opción en el cuidado del parto requiere un enfoque estructurado y basado en evidencia. Las investigaciones futuras no solo deben consolidar el conocimiento existente, sino también explorar nuevas áreas de interés que puedan mejorar aún más los resultados maternos y neonatales:

- **Hipnoterapia:**

La investigación en el campo de la hidroterapia en el parto y la hipnoterapia es un área prometedora y de creciente interés debido a sus potenciales beneficios para la salud materna y neonatal. Ambas intervenciones no farmacológicas ofrecen alternativas para el manejo del dolor y la ansiedad durante el parto, con un enfoque en la experiencia positiva del nacimiento. Una línea importante de investigación es la comparación directa de la eficacia de la hidroterapia y la hipnoterapia en el manejo del dolor durante el parto.

- Fernández-Gamero L, Reinoso-Cobo A, Ruiz-González MdC, Cortés-Martín J, Muñóz Sánchez I, Mellado-García E, Piqueras-Sola B. Impact of Hypnotherapy on Fear, Pain, and the Birth Experience: A Systematic Review. *Healthcare*. 2024; 12(6):616. https://doi.org/10.3390/healthcare12060616

- **Control de diabetes gestacional y técnicas no farmacológicas durante el parto:**

Dado que el estrés puede influir negativamente en el control de la glucosa, es importante investigar si la hidroterapia, conocida por sus efectos relajantes, puede reducir el estrés y, por ende, mejorar el control glucémico en mujeres con diabetes gestacional.

- Sánchez-García JC, Saraceno López-Palop I, Piqueras-Sola B, Cortés-Martín J, Mellado-García E, Muñóz Sánchez I, Rodríguez-Blanque R. Advancements in Nutritional Strategies for Gestational Diabetes Management: A Systematic Review of Recent Evidence. *Journal of Clinical Medicine*. 2024; 13(1):37. https://doi.org/10.3390/jcm13010037


- **Recuperación Física Post-COVID-19**

Una línea de investigación prometedora es la recuperación física post-COVID-19, particularmente relevante en el contexto de la atención perinatal. El impacto de la pandemia en mujeres embarazadas y nuevas madres ha resaltado la necesidad de estrategias efectivas de recuperación. Una revisión sistemática reciente sobre las terapias físicas en el tratamiento del síndrome post-COVID ha proporcionado información valiosa en este ámbito (Sánchez- García et al., 2023). Los estudios futuros podrían explorar cómo estas terapias pueden ser adaptadas e integradas en los protocolos de cuidado postparto, especialmente para aquellas que han experimentado hidroterapia durante el parto. Esto podría conducir a modelos de atención integral que aborden tanto los resultados inmediatos del parto como las necesidades de recuperación a largo plazo.

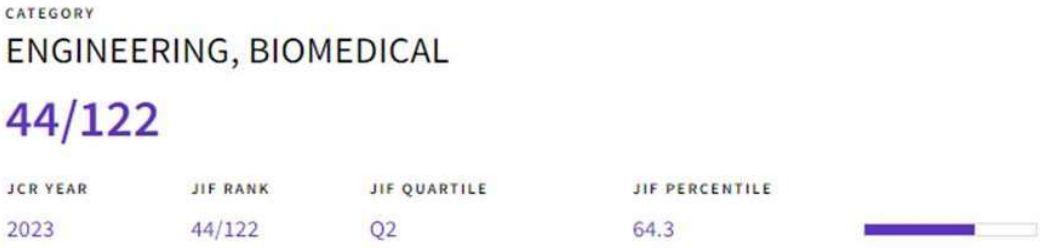
- Sánchez-García JC, Rentero Moreno M, Piqueras-Sola B, Cortés-Martín J, Liñán-González A, Mellado-García E, Rodriguez-Blanque R. Physical Therapies in the Treatment of Post-COVID Syndrome: A Systematic Review. *Biomedicines*. 2023; 11(8):2253. https://doi.org/10.3390/biomedicines11082253


- **Integración de Aplicaciones Móviles con Realidad Aumentada en la Hidroterapia Durante el Parto.**

El uso de nuevas tecnologías puede mejorar aún más la experiencia del parto y los resultados maternos y neonatales, por ello, la necesidad de explorar una línea de investigación prometedora en la integración de aplicaciones móviles con realidad aumentada (AR) en la hidroterapia durante el parto. Las aplicaciones móviles con AR han mostrado potencial en diversos campos de la salud, especialmente en la promoción de la actividad física y la mejora del bienestar mental, como se evidencia en una revisión sistemática reciente (Piqueras-Sola et al., 2024).

La visualización en tiempo real de las aplicaciones AR podría ofrecer a las mujeres en trabajo de parto visualizaciones en tiempo real de técnicas de respiración, posiciones para el alivio del dolor y ejercicios de relajación. Esto puede ayudar a reducir la ansiedad y proporcionar un enfoque interactivo para el manejo del dolor. Incluso previo al parto, las aplicaciones AR podrían utilizarse para educar a las futuras madres sobre el proceso del parto en el agua, permitiéndoles familiarizarse con las técnicas y posiciones antes del trabajo de parto real.

- Piqueras-Sola B, Cortés-Martín J, Rodríguez-Blanque R, Menor-Rodríguez MJ, Mellado-García E, Merino Lobato C, Sánchez-García JC. Systematic Review on the Impact of Mobile Applications with Augmented Reality to Improve Health. *Bioengineering*. 2024; 11(6):622. https://doi.org/10.3390/bioengineering11060622



# *CONCLUSIONES*

1. La hidroterapia durante el parto es un eficaz método analgésico no farmacológico, que potencialmente reduce la necesidad de anestesia epidural. Sin embargo, se asocia con una prolongación de la duración del parto en sus distintas etapas. El uso de hidroterapia durante el parto es más común en mujeres primigestas y no influye significativamente en aquellas con antecedentes de abortos.

2. La hidroterapia se asocia con una disminución en el uso de oxitocina y amniotomía, favoreciendo partos vaginales espontáneos y potencialmente reduciendo la necesidad de intervenciones instrumentales y cesáreas.

3. El uso de hidroterapia durante el parto no se asocia a un mayor riesgo de lesiones perineales, hipotensión materna o fiebre postparto. Asimismo, los estudios realizados no encontraron vínculos entre el uso de hidroterapia y el aumento de hemorragia postparto. Estos hallazgos sugieren que la hidroterapia es un método seguro para la madre durante el proceso del parto.

4. El empleo de hidroterapia durante el parto no se asocia a un mayor riesgo de complicaciones neonatales o ingresos en la unidad de neonatología, en comparación con los partos sin el uso de este método. Esto indica que el estado de salud y la estabilidad fisiológica de los recién nacidos son óptimos con la aplicación de la hidroterapia, lo que la convierte en una técnica segura para el neonato.

5. El uso de la hidroterapia sugiere una posible influencia positiva en la decisión por optar por la lactancia materna.

6. Tanto la ducha terapéutica como la bañera han probado ser técnicas seguras y eficaces para proporcionar alivio del dolor durante el parto, sin presentar riesgos significativos para la salud materna o neonatal. Si bien la bañera demostró una mayor efectividad en la reducción del dolor en comparación con la ducha, esta última se asoció a una disminución en la duración total del proceso del parto. No obstante, la ducha terapéutica podría ser preferible debido a su asociación con una menor duración del parto, así como una incidencia más baja de desgarros perineales y episiotomías.

# ANEXO

JUNTA DE ANDALUCIA

**Consejería de Salud**
Agencia Sanitaria Costa del Sol
Distrito de Atención Primaria Costa del Sol
**Comité de Ética de Investigación Costa del Sol**

# DICTAMEN DEL COMITÉ DE ÉTICA DE LA INVESTIGACIÓN

Ref.: FRR/ LB

D. Francisco Rivas Ruiz, Secretario del Comité de Ética de Investigación Costa del Sol, CEI acreditado y constituido conforme a los requisitos establecidos en la legislación vigente, con sede indicada en el pie de página,

CERTIFICA

que dicho Comité, en su reunión celebrada con fecha 25 de Octubre de 2018, con la asistencia de los miembros recogidos en el anexo, ha ponderado los aspectos metodológicos, éticos y legales del proyecto de investigación cuyos datos identificativos se refieren a continuación, el balance de riesgos y beneficios anticipados dimanantes del estudio, y evaluado la cualificación del investigador principal y la del equipo investigador, así como la factibilidad del proyecto, conforme a lo dispuesto en el artículo 12, de la Ley 14/2007, de 3 de julio, de Investigación Biomédica (B.O.E. núm. 159, de 4/7/2007) y ACORDADO la emisión de **INFORME FAVORABLE CONDICIONADO**, por la motivación expuesta y con los efectos derivados de lo establecido en el apartado e), del artículo 2, de la citada Ley, según consta todo recogido en el acta de la reunión del Comité, número 78-10-2018, de 25 de Octubre de 2018.

Título del estudio: Efectos de la hidroterapia durante el trabajo de parto en términos de salud materna y neonatal.
Código del estudio: 002_oct18_PI – Hidroterapia parto
Código interno del estudio: Hidroterapia parto
Versión y fecha de protocolo: Versión 1 – 16 octubre 2018
Versión y fecha de la hoja de información al paciente: Versión 1 – 16 octubre 2018
Versión y fecha del consentimiento informado: Versión 1 – 16 octubre 2018
Promotor: Agencia Sanitaria Costa del Sol
Solicitante: Elena Mellado García
Investigador coordinador: Juan Carlos Higuero Macías
Investigadores principales: Elena Mellado García
Investigadores colaboradores: Juan Carlos Higuero Macías, José Claudio Maañón Di Leo

Consideraciones:

El proyecto obtiene el V°B° tras subsanación de mejoras menores solicitadas en reunión del 25 de octubre de 2018

En Marbella, a 20 de noviembre de 2018.

EL SECRETARIO DEL COMITÉ

Fdo. Francisco Rivas Ruiz

CONSEJERÍA DE SALUD Agencia Sanitaria Costa del Sol JUNTA DE ANDALUCIA Comité Ético de Investigación Clínica C.I.F.:Q-7955060-D

ANEXO

RELACIÓN DE ASISTENTES

Fecha de la reunión: 25 de Octubre de 2018.

Presidente:

D. Luís Baró Rodríguez

Vicepresidente:

D. Alejandro Pérez Cabeza

Secretario:

Vocales:

D. Marta Aranda Gallardo,

Dña. Anabel Calderón Durán,

D. Secundino Castillo Sánchez,

Dña. Yolanda de Mesa Berenguer,

D. José Luís Moreno Haro,

D. Raúl Quirós López,