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Effect of intrathecal injection of bupivacaine and dexamethasone injection on neonatal sepsis

Submission date
02/12/2025

Recruitment status
No longer recruiting

Registration date
12/12/2025

Overall study status
Ongoing

Last Edited
10/12/2025

Condition category
Neonatal Diseases

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[X] Record updated in last year

Plain English summary of protocol
Not provided at time of registration

Contact information

Type(s)
Principal investigator, Scientific, Public

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Study information

Scientific Title
The use of bupivacaine and dexamethasone combination for labour pain management also reduces neonatal sepsis

Study objectives
1. To determine the prevalent of neonatal sepsis in War Memorial Hospital
2. To determine the source of neonatal bacterial infections

3. To investigate common types of maternal and neonatal bacterial infections during pregnancy and labour
4. To investigate the effects of intrathecal injections of bupivacaine with dexamethasone for labour pain management on maternal bacterial infections during pregnancy
5. To investigate the effects of intrathecal injections of bupivacaine with dexamethasone for labour pain management on neonatal bacterial infections during pregnancy and labour
6. To determine the effects of intrathecal injections of bupivacaine with dexamethasone for labour pain management on neonatal outcomes
7. To investigate the effects of labour pain on neonatal sepsis

Ethics approval required
Ethics approval required

Ethics approval(s)
approved 30/01/2025, Navrongo Health Research Center Institutional Review Board (PO Box 114, Navrongo, +233, Ghana; +233 (0)591152102; irb@navrongo-hrc.org), ref: NHRCIRB681

Primary study design
Interventional

Allocation
Randomized controlled trial

Masking
Blinded (masking used)

Control
Dose comparison

Assignment
Single

Purpose
Diagnostic, Health services research, Prevention, Supportive care, Treatment

Study type(s)

Health condition(s) or problem(s) studied
Neonatal sepsis

Interventions
Randomisation and blinding procedure (sealed-envelope random draw; double-blinded): Participants will be allocated to one of the three treatment arms in a 1:1:1 ratio using a sealed-envelope randomisation process. Before recruitment begins, an independent staff member, uninvolved in screening, enrolment or clinical procedures will prepare identical, opaque, sealed envelopes containing the treatment assignments. These envelopes will be thoroughly mixed and arranged sequentially to maintain allocation unpredictability.

For each eligible participant who provides consent, the next envelope in sequence will be drawn and given to the designated anaesthesia provider immediately prior to the intrathecal procedure. The envelope will be opened only at that moment by a designated individual who is

not administering the injection and the corresponding pre-labelled study syringe will be provided. This process ensures that both the participant and the anaesthetist are blinded to the treatment allocation, preserving allocation concealment, minimizing performance and selection bias, and enhancing the scientific rigor of the study.

Common procedures (all treatment arms):
Route: Intrathecal (subarachnoid/spinal) injection during active labour, performed under strict aseptic technique.
Frequency: Single administration (one-shot spinal injection).
Neonatal follow-up: Neonates will be monitored during the early postnatal period for signs of sepsis (events occurring within the first 28 days) with relevant outcomes including NICU admission, blood cultures and neonatal status documented according to protocol.

Group I — Bupivacaine + Dexamethasone (Intervention):
Drugs: Bupivacaine (local anaesthetic) + Dexamethasone (corticosteroid).
Dose: Bupivacaine 2 mg intrathecal + Dexamethasone 4 mg intrathecal.
Method: Single-shot intrathecal injection during active labour.
Duration: One-time administration; analgesia monitored throughout labour; dexamethasone expected to prolong block. Maternal pain scores and duration of analgesia recorded.
Neonatal follow-up: Standardized postnatal monitoring including blood cultures, Apgar scores, NICU admission and neonatal outcomes through the first 28 days.

Group II — Bupivacaine Only (Comparison):
Drug: Plain intrathecal Bupivacaine.
Dose: 2 mg intrathecal (same as intervention arm).
Method: Single-shot intrathecal injection during active labour.
Duration: One-time administration; analgesia monitored throughout labour; expected to provide shorter analgesic duration than combination arm.
Neonatal follow-up: Same as Group I.

Group III — Control (Placebo/No Active Intrathecal Analgesia):
Treatment: 0.9% Normal Saline intrathecal injection.
Method: Single intrathecal injection at enrolment (placebo).
Duration: One-time administration; standard care otherwise with no neuraxial analgesia.
Neonatal follow-up: Same as Groups I and II.

Bupivacaine:
Bupivacaine in its unadulterated form, with a stock concentration of 0.5%, will be procured from AstraZeneca, a pharmaceutical company based in Ghana. This particular brand has received approval from the Food and Drug Authority of Ghana for use within hospital settings.

Dexamethasone:
A sodium phosphate injection of dexamethasone, formulated without preservatives at a concentration of 4 mg/ml and packaged in ampoules, will be procured from Ryan Pharmaceutical Company in Ghana. This particular formulation has received approval from the Food and Drug Board for use in the treatment of various medical conditions within healthcare facilities in Ghana.

This research will utilize a prospective cohort study design. Participants will be administered a combination of bupivacaine and dexamethasone for the management of labor pain. Following the intervention, the study will monitor several outcomes, including the incidence of neonatal

sepsis (the most prevalent bacterial infection contracted by neonates' post-delivery) the sources of bacterial infection, the analgesic effects experienced by the mother, and the overall impact of the treatment on neonatal outcomes.

The research will be conducted at a secondary referral hospital, specifically the War Memorial Hospital, which serves as the exclusive secondary referral center in the Kassena-Nankana region. This facility offers emergency obstetric care, surgical services, and various public health interventions. It is situated at coordinates 10°535N 1°525W within the Kassena-Nankana Municipal area, one of the fifteen districts in the Upper East Region of Ghana. Historically, this district was part of the larger Kassena-Nankana District until 1988, when the western segment was delineated to form the Kassena-Nankana West District on 29 February 2008. Consequently, the remaining area was re-designated as the Kassena-Nankana East District, which achieved municipal assembly status on 28 June 2012, thus becoming the Kassena-Nankana Municipal District. This municipality is located in the western portion of the Upper East Region, with Navrongo serving as its administrative capital.

The climatic conditions in the region are characterized by two predominant seasons: the short rainy season, which occurs from June to September, and the dry season, spanning from October to May. The harmattan winds reach their peak intensity during the months of January and February. During the dry season, temperatures fluctuate between 20°C and 40°C, accompanied by an average annual precipitation ranging from 850 to 1000 mm. In the Upper East region, the majority of the population engages in rain-fed subsistence agriculture. However, practices such as overcropping, coupled with increasingly erratic rainfall patterns, have led to a decline in agricultural productivity, thereby exacerbating poverty levels. Currently, the prevalence of poverty in this region stands at 55%, positioning it among the three poorest regions in Ghana due to these compounding factors.

Navrongo is a town that serves as the administrative capital of the Kassena-Nankana District, located in the Upper East Region of northern Ghana, near the border with Burkina Faso. According to the 2012 census, the population of the settlement was recorded at 27,306 individuals.

The War Memorial Hospital (WMH) is situated within the Kassena-Nankana Municipality, which encompasses an area of 1,675 square kilometers. This municipality shares its borders with Burkina Faso to the northeast, the Bongo and Bolgatanga Districts to the east and northeast, and the Bulisa and Sissala Districts to the southwest and west, respectively. Approximately 90% of the population resides in rural settings, with Navrongo, the municipal capital, featuring a relatively small suburban area. The predominant type of settlement consists of small communities, with an average of ten individuals per household, all of whom are typically part of closely-knit extended families.

This 169-bed facility caters to an approximate population of 196,000 individuals and accepts referrals from various towns and regions within Burkina Faso, in addition to several primary healthcare services in the vicinity, including private clinics. According to unpublished data from the hospital, the institution experiences an average of approximately 87,000 outpatient department visits and 12,000 inpatient admissions annually, with maternal-related conditions constituting one of the ten most prevalent reasons for hospitalization. Each year, the facility records around 3,600 prenatal visits and 1,900 deliveries.

The hospital is furnished with advanced facilities and staffed by a team of highly experienced healthcare professionals, including obstetricians, Clinical Research Associates (CRAs), and pediatric nurses. This research environment is conducive to the recruitment of participants, the implementation of interventions, and the assessment of outcomes.

Sampling technique:
In this prospective cohort study, a non-probability sampling method will be employed, whereby participants are selected based on their availability, accessibility, or willingness to engage in the research. The recruitment of participants will take place within a singular hospital environment, where the administration of intrathecal injections of bupivacaine and dexamethasone for labor analgesia is a standard practice.

Validity and reliability:
The reliability of the instrument will be evaluated through a peer review process. Its validity will be assessed by conducting a pretest on a select sample. This approach aims to ensure that all materials utilized in this study accurately measure the intended constructs. Research assistants will receive training, and the pre-testing of the data collection tools will be securely stored in a locked facility. Regular meetings with research assistants will be convened to address any issues related to data collection.

Pilot study:
The assessment will be administered to a cohort of 10 pregnant women who are currently experiencing active labor in the labor ward of Paga Hospital. This procedure aims to facilitate essential modifications to the instruments utilized.

Data Collection:
All participants will undergo evaluation and categorization based on the American Society of Anesthesiologists (ASA) physical status classification system, and only those meeting the specified inclusion criteria will be incorporated into the study.

Baseline vital signs will be assessed prior to the initiation of the procedure. A blood sample from the mother will be obtained prior to the administration of pharmacological agents and will be preserved in a properly labeled blood collection container (EDTA tube) for the purpose of evaluating the presence of any bacterial infection.

The individual pregnant patient, who is currently in the active phase (second stage) of labor, will be positioned in a seated posture. The skin and interspinous ligament will be infiltrated with 2 mL of preservative-free lidocaine utilizing a 21G hypodermic needle. A 25G spinal needle will then be inserted into the subarachnoid space via a midline approach at the L3-L4 intervertebral space. Confirmation of successful spinal needle placement in the subarachnoid space will be achieved through the observation of cerebrospinal fluid backflow. Subsequently, 2.5 mg of plain bupivacaine and 4 mg of dexamethasone will be administered into the subarachnoid space slowly over a duration of 30 seconds. Following this procedure, the patient will be instructed to return to a supine position after securely dressing the injection site.

Blood samples from both the mother and the neonate will be collected promptly following delivery. The infant's blood will be obtained from the umbilical cord and placed into an EDTA tube for sample collection, with additional samples to be taken at 24, 48, and 72 hours post-delivery. Further investigations aimed at identifying the sources of neonatal infections will involve swabbing various surfaces, including the delivery sheets, the apron and gown of the attending midwife, to ascertain the types of bacteria present on delivery equipment and within the labor ward environment.

Bacterial isolation process:
Sample Preparation:
Blood samples collected in EDTA tubes, appropriately labeled with patient identification, are prepared for subsequent laboratory analysis by centrifuging to separate the cellular components from the plasma.

Gram Staining:
A widely utilized method for bacterial identification in blood is Gram staining. In this procedure, a small aliquot of the prepared sample is applied to a microscope slide and stained with crystal violet and safranin. Bacteria that retain the crystal violet stain are classified as Gram-positive, whereas those that do not retain the stain are classified as Gram-negative.

Culture and Isolation:
The subsequent step involves culturing the bacteria from the blood sample. A small volume of the sample is inoculated onto various culture media, including blood agar, MacConkey agar, and chocolate agar. These media supply essential nutrients conducive to bacterial growth and facilitate the isolation of the bacteria present in the blood.

Biochemical Tests:
Following the isolation of the bacteria, they undergo a series of biochemical tests designed to elucidate their specific characteristics. These tests assess the bacteria's capacity to ferment particular sugars, produce specific enzymes, or respond to certain chemicals, thereby aiding in their identification.

Data Handling:
Data will be subjected to continuous verification to ensure its completeness. It will be entered twice using EPIDATA and subsequently exported to the Statistical Package for the Social Sciences (SPSS) version 20.1 for analysis. Additionally, a backup of the data will be created.

Expected Outcomes:
The incorporation of dexamethasone into bupivacaine for labor analgesia is anticipated to yield sufficient analgesic effects during labor while also producing a synergistic impact on the reduction of inflammation and infection in both mothers and neonates, consequently diminishing the likelihood of sepsis development.

Dissemination of results:
A detailed report will be prepared based on the collected data and submitted to the Department of Anesthesia and Intensive Care at the School of Medical Sciences, CKT-UTAS, as a partial fulfillment of the requirements for the Master of Philosophy (MPhil) degree in Anesthesia and Critical Care. Additionally, a manuscript will be drafted for submission to a peer-reviewed journal. A copy of the presentations will be archived in the university library for record-keeping purposes. Furthermore, the report will be disseminated to stakeholders within the Kassena Nankana Municipality to facilitate policy implementation. The findings will also be presented at both local and international conferences.

Ethical considerations:
Ethical approval will be obtained from the Navrongo Health Research Ethics Committee. Additionally, authorization will be secured from the management of War Memorial Hospital and Paga Hospital to conduct the research within their facilities. The objectives and significance of the study will be clearly communicated to the participants. Participation will be entirely voluntary, and individuals will have the right to withdraw from the study at any time without any

repercussions. All data and information gathered will be treated with strict confidentiality and will be utilized solely for the purposes of this research.

Intervention Type
Drug

Phase
Not Applicable

Drug/device/biological/vaccine name(s)
Bupivacaine, dexamethasone

Primary outcome(s)
1. Incidence of neonatal sepsis measured using clinical evaluation of newborns for signs consistent with infection (e.g., fever, respiratory difficulty, poor feeding, lethargy); review of laboratory investigations, including documented blood culture results; confirmation based on standard clinical and laboratory criteria recorded in neonatal medical charts; at at birth during the initial neonatal assessment, throughout the hospital stay, including NICU monitoring where applicable, and up to 28 days after delivery as part of routine neonatal follow-up.

Key secondary outcome(s))
1. Duration of intrapartum analgesia measured by observation and documentation of the interval between drug administration and the point at which analgesic effect diminished; labour ward analgesia records maintained by clinical staff;
continuously observed from the time of intrathecal injection until analgesia was judged to have worn off.
2. Pain severity reported by the mother during labour, measured using pain scores documented on labour monitoring forms (e.g., numerical rating scales noted in clinical records), before intrathecal administration (baseline) and at designated intervals during labour, including at peak contractions and when the block begins to wear off.
3. Final delivery outcome (spontaneous vaginal birth, assisted vaginal delivery or caesarean section), extracted from maternal obstetric records at completion of labour.
4. Standard Apgar assessment (0–10), evaluating respiratory effort, heart rate, tone, reflex irritability and colour, obtained from neonatal delivery documentation recorded at 1 minute and 5 minutes post-delivery.
5. Neonatal admission to the NICU and length of stay measured by review of neonatal clinical notes and NICU admission logs within the first 24 hours after delivery and monitored throughout the NICU stay.
6. Neonatal blood culture result (positive or negative) taken from laboratory culture reports recorded in neonatal clinical files as clinically indicated during postnatal hospitalisation. Results considered within the neonatal period (first 28 days of life).
8. Maternal age, parity, gestational age, booking status and neonatal characteristics (descriptive variables, not efficacy outcomes), extracted from maternal and neonatal clinical records at enrolment for maternal baseline information and at delivery for neonatal characteristics.

Completion date
17/12/2025

Eligibility

Key inclusion criteria

1. Pregnant women who are in active labour, with gestational age ranging from 37 weeks to 42 weeks
2. Participants (pregnant) ready to provide informed consent, have planned vaginal delivery
3. Pregnant women with accessible medical records for both mother and infant and demonstrate willingness to adhere to the study protocol and attend subsequent follow-up appointments

Healthy volunteers allowed
Yes

Age group
Adult

Lower age limit
18 years

Upper age limit
45 years

Sex
Female

Total final enrolment
198

Key exclusion criteria
1. Pregnancies involving multiple gestations
2. Instances of preterm labor (defined as gestational age less than 37 weeks)
3. Scheduled cesarean deliveries
4. Established contraindications to the intrathecal administration of bupivacaine or dexamethasone
5. A documented history of maternal infections such as chorioamnionitis, syphilis, or HIV
6. Particularly in patients receiving antibiotic therapy
7. An inability to provide informed consent
8. A lack of willingness to adhere to the study protocol or attend follow-up appointments

Date of first enrolment
05/03/2025

Date of final enrolment
24/05/2025

Locations

Countries of recruitment
Ghana

Sponsor information

Organisation
C.K. Tedam University of Technology and Applied Sciences

ROR
https://ror.org/00kpq4k75

Funder(s)

Funder type

Funder Name
C. K. Tedam University of Technology and Applied Sciences

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not expected to be made available