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DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

PREVALENCE AND ASSOCIATED FACTORS OF POSTDURAL PUNCTURE HEADACHE AFTER SPINAL ANESTHESIA FOR CESAREAN SECTION AT THREE TEACHING HOSPITALS IN ADDIS ABABA, ETHIOPIA; 2024/25 G.C

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July, 2025 G.C

Addis Ababa, Ethiopia

DECLARATION

I, Dr. Tadiwos Mekonnen, here by declare that this thesis, entitled 'Prevalence and associated factors of post-dural puncture headache after spinal anesthesia for cesarean section at three teaching hospitals in Addis Ababa, Ethiopia; 2024/2025 G.C.' has been fully carried out by myself under the guidance of my advisors in accordance with the requirements of the graduate studies and that I have, to the best of my knowledge and effort, avoided plagiarism or duplication of materials unless and otherwise cited and/or acknowledged and that it has not been so far submitted for any form of research application or consideration.

Dr. _____ _____ _____

Principal investigator Signature Date

We hereby certify that we have read and evaluated this thesis; that was under our guidance from its inception up to in its current format and that it can be submitted for approval of the thesis for her partial fulfillment to the degree of specialty in Obstetrics and Gynecology.

_____ _____ _____

1. Advisor Signature Date

_____ _____ _____

2. Advisor Signature Date

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TABLE OF CONTENTS

DECLARATION ii
ACKNOWLEDGEMENT iii
LIST OF FIGURES vi
ACRONYMS viii
ABSTRACT 1
1. INTRODUCTION 2
1.1 BACKGR OUND 2
1.2. STATEMENT OF THE PROBLEM 3
1.3. SIGNIFICANCE OF THE STUDY 4
2. LITERATURE REVIEW 6
2.1 PREVALENCE OF POST DURAL PUNCTURE HEADACHE 6
2.2 FACTORS ASSOCIATED TO POST DURAL PUNCTURE HEADACHE 7
2.3 CONCEPTUAL FRAME WORK 10
3. OBJECTIVES 11
3.1 GENERAL OBJECTIVE 11
3 .2 SPECIFIC OBJECTIVE 11
4. METHODS AND MATERIALS 12
4.1 STUDY DESIGN 12
4.2. STUDY AREA AND PERIOD 12
4.3 POPULATION 13
- **4.3.1 SOURCE POPULATION** 13
- **4.3.2 STUDY POPULATION** 13

4.4 INCLUSION AND EXCLUSION CRITERIA 13
4.5. SAMPLE SIZE DETERMINATION AND SAMPLING TECHNIQUE 13
- **4.5.1 SAMPLE SIZE DETERMINATION** 13
- **4.5.2. SAMPLING TECHNIQUE** 14

4.6. VARIABLES 15
- **4.6.1. DEPENDENT VARIABLE** 15
- **4.6.2 INDEPENDENT VARIABLES** 15

4.6 OPERATIONAL DEFINITIONS 15
4.8. DATA COLLECTION TOOL AND TECHNIQUES 16
4.9. DATA QUALITY CONTROL AND MANAGEMENT 17
4.10. DATA PROCESSING AND ANALYSIS 18
4.12. DISSEMINATION PLAN 19
5. RESULT 20
5.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PATIENT 20

5.2 OBSTETRICS RELATED CHARACTERISTICS OF THE STUDY PARTICIPANTS.. 22
5.3 INDICATION FOR CAESAREAN SECTION AMONG THE STUDY PARTICIPANTS 23
5. 4 THE ANAESTHESIA CHARACTERISTICS OF THE STUDY PARTICIPANTS 24
5.5 CHARACTERISTICS OF PARTICIPANTS ON HISTORY OF PREVIOUS SPINAL ANESTHESIA AND HEADACHE FOLLOWING THE SPINAL ANESTHESIA 25
5.6 THE CHARACTERISTICS OF POST-DURAL PUNCTURE HEADACHE..... 26
5.7 THE PREVALENCE OF POST-DURAL PUNCTURE HEADACHE 27
5.8 THE DETERMINANT FACTORS OF POST-DURAL PUNCTURE HEADACHE 27
6. DISCUSSION 30
7. STRENGTH AND LIMITATION OF THE STUDY 32
8. CONCLUSION 32
9. RECOMMENDATION 33
10. REFERENCES..... 34
ANNEXES 37
Annex 1: Information sheet for the participants..... 37
Annex 2: Information sheet for the participants (Amharic Version)..... 39
Annex 3: Consent form of the participants 41
Annex 4: Consent form of the participants (Amharic Version) 42
Annex 5: English version questionnaire..... 43
Annex 6: Amharic version questionnaire 48
ANNEXES 53
Annex 1: Information sheet for the anesthesia provider 53
Annex 2: Consent form of the anesthesia provider..... 55

LIST OF FIGURES

Figure 1. Conceptual framework showing the factors associated with postdural headache (Adapted from review of literatures, [1, 2, 3, 5, 7 10, 15, 18, 19, 23. 24, and 27]……. 10
Figure 2. Indication for caesarean section among the study participants……..244
Figure 3. The prevalence of Post-dural Puncture Headache among women delivered by cesarean section……27

LIST OF TABLES

Table 1. The sociodemographic characteristics of the study participants among women who delivered by cesarean section in the three teaching hospitals of Addis Ababa university. 20
Table 2. Obstetrics related characteristics of the study participants.....22
Table 3. The anesthesia characteristics of the study participants 25
Table 4. Characteristics of participants on history of previous spinal anesthesia and headache following the spinal anesthesia…… 26
Table 5. The characteristics of Post-dural Puncture Headache among the study participants……27
Table 6. The bivariate and multivariate logistic regression of association between PDPH and independent variable among women who gave birth by C/S in the three teaching hospitals of Addis Ababa university…….. 28

ACRONYMS

AAU	Addis Ababa University
AOR	Adjustable Odd Ratio
ASA	American Society of Anesthesiologists
BMI	Body Mass Index
CI	Confidence Interval
COR	Crude Odd Ratio
CSA	Central Statistical Authority
CSF	Cerebrospinal Fluids
C/S	Cesarean Section
DHS	Demographic and Health Survey
GMH	Gandhi Memorial Hospital
OR	Odds Ratio
PDPH	Post-Dural Puncture Headache
PSH	Post Spinal Headache
SDG	Sustainable Development Goals
SSA	Sub-Saharan Africa
TASH	Tikur Anbessa Specialized Hospital
ZMH	Zewditu Memorial Hospital

ABSTRACT

Background: - Post-dural puncture headache (PDPH) is one of the major complications of spinal anesthesia. It occurs in 32% of patients carrying a considerable morbidity. Also, the associated symptoms last for several days, at times severe enough to impair patient's quality of life. Several risk factors contribute for the development of post-dural puncture headache which varies with characteristics of individual patients, the type of spinal needle and the technique or approach used.

Objective: - To assess the prevalence and associated factors of post-dural puncture headache after spinal anesthesia for caesarean section at three teaching hospital in Addis Ababa, Ethiopia.

Method: - An institution based cross-sectional study was conducted at 3 teaching hospitals of Addis Ababa university. Consecutive sampling technique was used to include 904 study participants of post-operative women during the study periods of December 15, 2024 G.C. – May 31, 2025 G.C. The data were coded, entered, and analysed by using SPSS version 25. Descriptive statistics were used to describe the study variables. Logistic regression analysis was used to assess associated factors of post-dural puncture headache. A p-value of < 0.05 was considered statistically significant.

Results: PDPH was observed in 38.4% of patients (n=347), with the majority reporting a mild headache (76.9%). Most headaches developed within the first 1–2 days post-procedure (72.3%). Associated symptoms included neck stiffness (85.9%) and tinnitus (38.3%). Significant risk factors identified included age ≥35 years (AOR: 2.7), ASA class III status (AOR: 1.9), previous spinal anesthesia (AOR: 3.1), high gravidity (≥5), and emergency cesarean section (AOR: 2.7). Technical factors such as increased number of cerebrospinal fluid drops (AOR for three drops: 3.3) and multiple puncture attempts (AOR for three attempts: 31.6) greatly increased PDPH risk. Procedures performed by residents and anesthesiologists were also associated with higher PDPH incidence.

Conclusion: More than one-third of the study participants developed post-dural puncture headache (PDPH) following spinal anesthesia. Younger age, previous PDPH, higher gravidity, emergency cesarean section, multiple cerebrospinal fluid drops, repeated puncture attempts, and anesthesia administered by less experienced providers were independently associated with increased risk.

Key word: incidence, associated factors, post-dural puncture headache, spinal anesthesia, A.A; Ethiopia

1. INTRODUCTION

1.1 BACKGR OUND

A common form of regional anesthesia, spinal anesthesia, often referred to as subarachnoid block, is administered by injecting an anesthetic agent into the subarachnoid space. It has been used widely, particularly in obstetric patients undergoing cesarean delivery. Despite its extensive use, post-dural puncture headache (PDPH), often referred to as post-spinal puncture headache, is still linked to the procedure [1].

Quincke, Corning, and Wynter developed spinal anesthesia in 1885. For the first time, however, spinal anesthesia was purposefully administered with 3 milliliters of 0.5% cocaine by German surgeon Karl August Bier. Bier and Hildebrandt later administered spinal anesthesia on one another, and both of them suffered from clinical symptoms of mild to severe post-dural puncture headache (PDPH). A direct consequence of the puncture hole in the dura, which results in loss of CSF (acts as a cushion supporting and protecting the brain) causes downward displacement of the brain and resultant stretch on sensitive supporting structures [2-4].

For lower abdominal and lower extremity surgeries, spinal anesthesia is frequently utilized as it causes the least amount of physiological disturbance, which reduces stress response, improves operative conditions, causes minimal intraoperative blood loss, and reduces postoperative morbidity. However, post-dural puncture headache (PDPH) may develop following the procedure; first described in the year 1899. Ninety percent of headaches will occur within 2-3 days of the procedure [3,5].

Lower fetal and maternal morbidity and need for postoperative analgesics are two benefits of spinal anesthesia. However, post spinal headache that may be observed at postpartum period affects the overall wellbeing of patients, resulting in decreased newborn care and increased complaints of the mother. As per the criteria outlined in International Classification of Headache Disorders, post-dural puncture headache refers to a kind of headache that emerges during five days following the dural puncture, which deteriorates in the sitting or erect position, coughing, sneezing or straining and diminished in supine position [6-9].

Post-dural puncture headache (PDPH) is one of major complications of spinal anesthesia. It occurs in 32% of patients carrying a considerable morbidity. Also, the associated symptoms last for

several days, at times severe enough to impair patient's quality of life. Different modalities are on trial to decrease its incidence [5].

Although the exact mechanism of the PDPH is not known, there are two likely explanations: First, a drop in the CSF pressure causes stretching of intracranial structures, which are pain sensitive and are responsible for the classic headache. Second, release of CSF triggers a compensatory vasodilation. A number of risk factors, such as the size and shape of the spinal needle, the direction of the needle's bevel, the number of dural punctures performed, age, pregnancy status, and prior medical history, all have a significant impact on the likelihood of post-dural puncture headache (6). Even today, PDPH is a major clinical problem and a frequent consequence in the fields of pain management and anesthesiology [7, 8].

0.7 % of obstetric patients who received neuraxial anesthesia experienced PDPH, according to the multicenter Serious Complication Repository research. This rate can range from 1 to 10%, depending on the spinal needle's diameter. PDPH should be diagnosed and monitored carefully since it limits the mother's ability to care for both herself and her child (7).

1.2. STATEMENT OF THE PROBLEM

Post-dural puncture headache is a common side effect of neuraxial anesthesia in obstetric patients worldwide. PDPH can increase the length of hospital stay and is associated with low patient satisfaction and increased hospital readmission. Some factors known to be the causes of PDPH in obstetric patients include the patient's weight, large gauge spinal needle, Quincke needle, multiple puncture attempt. However, it cannot be concluded or confirmed these factors in our population to be the same in our setting [8-11].

The belief that unskilled persons could administer and that monitoring was not necessary was a major contributing factor in postural puncture headache. This can be seen during the postpartum period, impacting patients' general health and leads to a decline in newborn care and an increase in mother complaints (4). The pain due to PDPH is very intense and leads to significant distress for the patient, and is additionally associated with increased hospital stays and enhanced health care facility expenses as well as frequent visit to hospital emergency department. Also, it may enhance the chance of refusal of spinal anesthesia by patients in future (6).

The CSF loss rises with the size of the needle used to puncture the dura, and if a Tuohy needle is utilized, the incidence of PDPH may reach as high as 70%. In a few cases, more severe neurological complications have developed, including intracranial hematomas and reduction of CSF pressure, since a chronic subdural hematoma may be mistaken for psychiatric disease, and seizures may be diagnosed as eclamptic and can persist indefinitely in a minority of cases (10).

The headache emerges or worsen within 15 minutes of standing up, and it disappear or gets better within 30 minutes of lying-in recumbent position. Even spinal anesthesia reducing mothers' suffering pain and shortening their hospital stay there is predictors of post dural puncture headache (11).

Pregnant women have an increased prevalence of PDPH. Depending on age, gender, and needle size, the incidence of PDPH, a frequent complication of lumbar puncture, ranges from 10% to 40% (12).

1.3. SIGNIFICANCE OF THE STUDY

In contrast to other permanent spinal anesthesia complications, post-dural puncture headache (PDPH) is an iatrogenic complication of spinal anesthesia, with signs and symptoms thought to be caused by loss of cerebrospinal fluid. Ethiopian healthcare focuses on providing primary healthcare through community-level initiatives, primarily focusing on reducing mortality and morbidity (14).

Less is known regarding the incidence, risk factors, and severity of PDPH in Ethiopia. By identifying the prevalence rate and related risk factors of PDPH in this area, the study's findings will aid in the development of protocols for the prevention and management of PDPH in obstetric patients. They can also serve as a baseline for further research on related subjects.

Studying this topic among women at teaching hospital of Addis Ababa University in Addis Ababa Ethiopia is important for university and study participants because PDPH is a significant indicator of maternity satisfaction for health care quality, health impact, risk assessment, clinical decision, patient safety and quality improvement through working on preventive measuring and devising management protocols biasing off the incidence and identified risk factors.

Second, the data from the study will serve as evidence for healthcare professionals and managers of healthcare facilities to use to make better decisions about management strategies, and clients

can request customized care plans that enhance patient safety and satisfaction, improving patient center care and potentially reducing the morbidity and mortality associated with complications from spinal anesthesia.

This study will also be helpful for researchers, policy maker and health bureau stakeholders in the planning and implementation of intervention activities to improve the spinal anesthesia utilization. Policy makers, health planners and managers design appropriate maternity services and put strategies by developing guideline and regulation to ensure appropriate use of caesarean section, thus contributing to improve maternal and neonatal health outcome.

2. LITERATURE REVIEW

Literatures related to post-dural punctual headache both at global and regional levels were reviewed and discussed with Ethiopian perspective. Literatures were searched mainly from three online electronic databases; Science Direct, PubMed and Google scholar and the search strategy was employed as follows; Databases were searched applying key words “incidence of post-dural puncture headache” OR “associated factors” OR “incidence of post-dural puncture headache and associated factors” OR “post-dural headache”. In addition, the search was repeated with the same keywords but including each African country. Google search has also been also applied where appropriate.

2.1 PREVALENCE OF POST DURAL PUNCTURE HEADACHE

According to a Jordanian study, only 43 (6.3%) of the participants developed PDPH, despite identified risk factors such as a history of tension headaches and recurrent punctures (1). A comparable study on the incidence of post-dural puncture headache (PDPH) and post-dural puncture backache (PDPB) in post-caesarean females after spinal anesthesia was carried out in India, and the findings showed that the rates were 15.3% and 6% respectively (2).

The same rates of PDPH have been seen for both the gauge and the kind of needle. A total of nine patients (18%) experienced PDPH. The incidence of PDPH did not differ significantly between the two groups; in India, 4 (8%) patients in the median approach group and 5 (10%) in the para median approach group developed classic PDPH (P=0.7268) (3). In the Pakistani study, three patients (5%) had PDPH using the median technique, but just one patient (1.6%) had PDPH using the para-median approach. There was no statistically significant difference (5).

In Turkey 8 of the 40 patients had a new-onset chronic headache after caesarean surgery, which was significantly higher than the rates in the other groups of the patients whose pre-existing headache worsened during the post caesarean section (7).

CSF loss from a dural puncture may cause headache, compensatory vasodilation, and intracranial hypotension. The CSF loss and headache frequency increase with the size of the needle used to puncture the dura. The incidence of PDPH can be as high as 70% if a Tuohy needle has been used on study done in South Africa (10) and the incidence of PDPH was found to be 48.8% in Uganda (11).

In three hospitals in Rwanda and the Democratic Republic of the Congo, the incidence of post-dural puncture headache was 33.3% (18) and 27.5% (19) respectively. Additionally, after spinal anesthesia for a Caesarean section, the incidence of post-dural puncture headache (PDPH) was 24.5% in Kenya (20) and 42.7% overall in a study conducted in the Gambia, where the majority of cases presented with occipital headache (29.2%), lasting for three hours (18%) (21).

In a cross-sectional study in Ethiopia, the prevalence of post-dural puncture headache and related factors was 28.7% at St. Paulo's and 25.7% at Dilla (12), (13). In a similar institution-based cross-sectional study in Gonder, 45 patients (38.8%) who had spinal anesthesia experienced post-dural puncture headache (16), and 42.6% of patients in a study in Bahir Dar developed PDPH (17).

The incidence of postural puncture headache was 20.2% (22) in a hospital-based longitudinal study at Debre Tabor General Hospital in Ethiopia in 2019, while the pooled prevalence of PDPH was estimated to be 23.47% (23) in another study conducted in 2021.

In Dilchora Hospital and Sabian Primary Hospital at Dire Dawa University in Ethiopia, an institutional based cross-sectional study found that 21.7% of patients had post-dural puncture headaches (24).

Hospital based cross-sectional study conducted at Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital, Addis Ababa, Ethiopia. Post-dural puncture headache after caesarean section with spinal anesthesia was reported to be 34.2% (25).

2.2 FACTORS ASSOCIATED TO POST DURAL PUNCTURE HEADACHE

In a study conducted in Jordan (1), frequent puncture attempts and the presence of tension headache were found to be significantly associated ($P<0.01$) with PDPH; another study conducted in Turkey revealed that needle shape, needle size, and needle orientation during puncture were important factors. Atraumatic needles cause tissue fibers to separate, which readily heals after the needle is removed. This lowers the risk of PDPH by preventing ongoing CSF leakage. Large-diameter needles create a larger dura mater opening, which raises PDPH (4).

Known risk factors of PDPH in Pakistan include young age and low parity because the dura become less elastic with increasing age. The increased level of estrogen in pregnant women leads to increased vessel distensibility in response to CSF hypotension hence, increased risk of PDPH. Pushing during the second stage of labor can increase the size of the dura hole leading to increase in CSF leak. All the patients were of younger age (5).

Administration of spinal anesthesia requires proper positioning of the patient and knowledge of spinal anatomy to deliver local anesthesia into the subarachnoid space**.** Depending on the surgical procedure, the targeted dermatome level varies. The C8 dermatome is examined at the fifth finger, the nipples at T4, the xphoid process at T7, and the umbilicus at T10. Following the operation, the sitting group experienced a considerably higher incidence of PDPH than the left lateral decubitus group (33.3% vs. 6.7%) (6).

Multiple logistic regression analysis in Turkey found that for every unit increase in pre-existing headache, the risk of worsening headache increased by 1.51 times. This is because decreased CSF volume pressure pulls on sensitive brain structures downward, and increased blood flow from CSF loss causes cerebral arteries and venous dilatation, which leads to PDPH (7). Additionally, a study conducted in Uganda found that blood loss exceeding 500 ml and previous spinal anesthesia exposure are the main risk factors (11).

Puncture level, number of attempts, age, body mass index, amount of CSF fluid drops, gauge needle size, sex, and type of procedure were all potential contributing factors. The incidence of post-dural puncture headache has been found to be increased by three factors: low-to-normal body mass index, obstetrical surgery, and young age. Furthermore, the best preoperative independent predictor of post-dural puncture headache was found to be 25-gauge needles (12) and (13).

A study in Gonder found risk factors such as repeated attempts and needle sizes, to be significantly associated with post-dural puncture headache (16) and, the multivariate logistic regression, to be significantly associated with the dependent variable of PDPH (17) among patients with PDPH in Bahir Dar.

Multivariable logistic regression revealed a statistically significant correlation between post-dural puncture headache and prior spinal anesthesia with a 20 and 22-gauge needle and repeated attempts (22). Having normal BMI, multiple attempts of spinal injection and spinal injection with a needle size of less than or equal to 22-gauge were positively associated with the PDPH (23).

Mothers who had spinal anesthesia with 22-gauge spinal needle were seven time (7X) more like to develop PDPH and single spinal attempts were also protective against PDPH on study done Dire Dawa (24).

The severity of this PDPH was usually ranging from mild, moderate, and rarely severe**.** Significant risk factors were body mass index <25 kg/m^2, prior PDPH after previous caesarean section (18) and in Democratic Republic of Congo were, history of spinal anesthesia, L2-L3 puncture level, puncture attempts > 3, needle diameter <25 gauge, overweight patients, low operator level, age > 35 years, parity > 5, Quincke's needle as well as urgent interventions (19).

High BMI, traumatic needle tip and the perpendicular orientation of needle were found to be associated with PDPH at Thika Level 5 Hospital of Kenya (20), similar study done in Gambia, gestational age; number of attempts; larger needle gauge and number of CSF drops, respectively were statistically significant factors (21).

2.3 CONCEPTUAL FRAME WORK

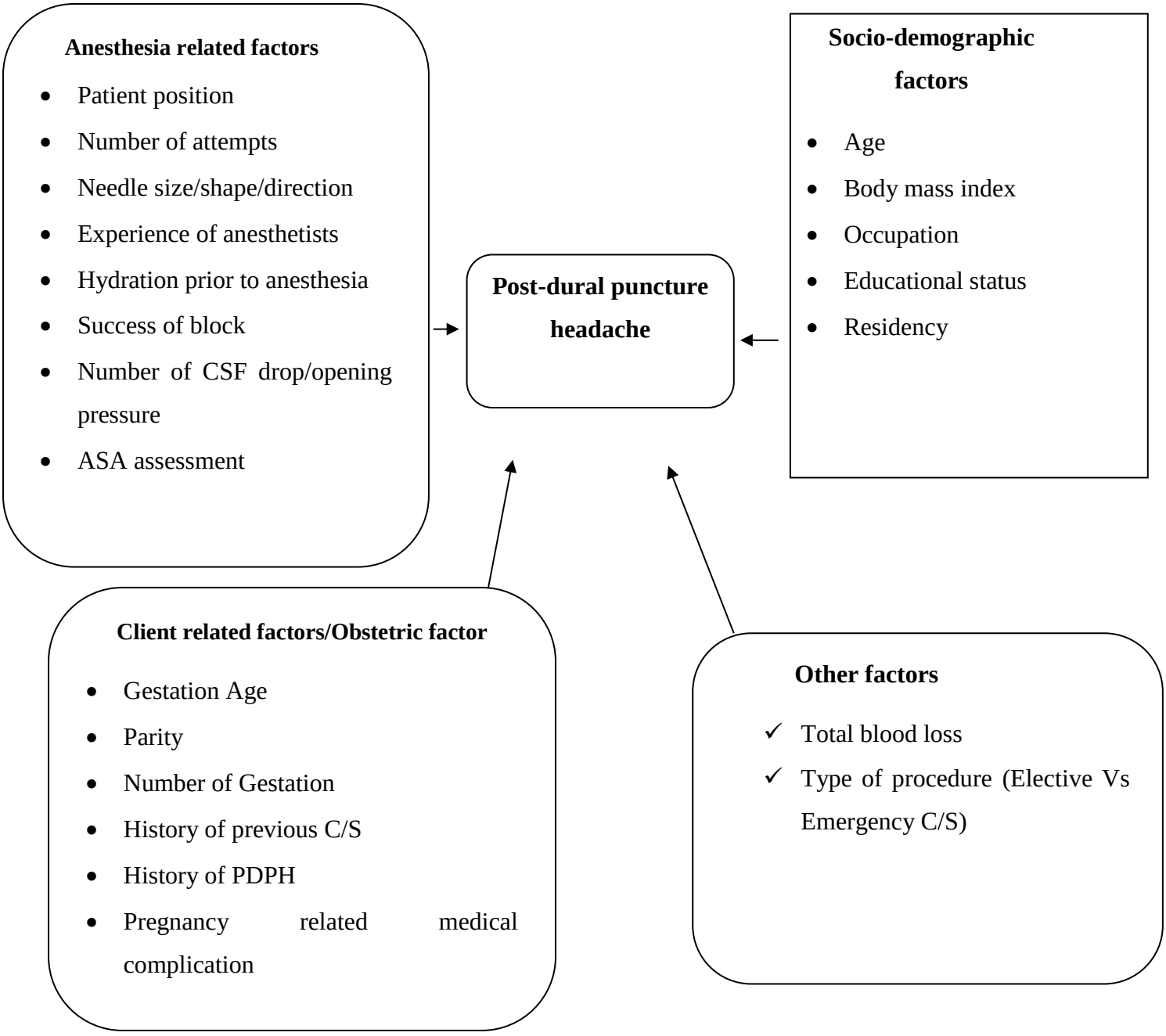


Figure 1. Conceptual framework showing the factors associated with post-dural headache (Adapted from review of literatures, [1, 2, 3, 5, 7 10, 15, 18, 19, 23. 24, and 27]

3. OBJECTIVES

3.1 GENERAL OBJECTIVE

- To assess prevalence and associated factors of post-dural puncture headache following spinal anesthesia for caesarean section at three teaching hospital, Addis Ababa, Ethiopia; 2024/25 G.C.

3 .2 SPECIFIC OBJECTIVE

- To assess prevalence of post-dural puncture headache after spinal anesthesia for caesarean section at three teaching hospital, Addis Ababa, Ethiopia; 2024/25 G.C.
- To identify factors associated to post-dural puncture headache after spinal anesthesia for caesarean section at three teaching hospital, Addis Ababa, Ethiopia; 2024/25 G.C.

4. METHODS AND MATERIALS

4.1 STUDY DESIGN

Institutional based cross-sectional quantitative study was conducted at three teaching hospitals of Addis Ababa University during the study period.

4.2. STUDY AREA AND PERIOD

The study area was at selected operation room and maternity/postnatal wards at the three teaching Hospitals of Addis Ababa University (AAU) namely, Tikur Anbessa Specialized hospital (TASH), Zewditu Memorial Hospital (ZMH), and Gandhi Memorial Hospital (GMH).

Ethiopia, a nation in the Horn of Africa, has Addis Ababa as its capital. The capital city is located 2,355 meters above sea level and occupies 527 kilometers. In terms of healthcare, the city currently boasts over 500 clinics, 28 health centers, 35 health posts, and over 41 hospitals. And is home to over 25 private hospitals and over 12 public hospitals. Of the total 12 public hospitals, 3 of them are selected by convenience and included in the study.

Teaching hospital of Addis Ababa University are selected for this study because of feasibility, access for enough sample, for being centers of referrals and teaching with different specialty units. Tikur Anbessa Specialized Hospital is the largest referral and teaching hospital in the country and is managed by Addis Ababa University, while the rest two are under Addis Ababa Health Bureau. All of the selected hospitals give antepartum, intrapartum and postpartum care including caesarean delivery service for 24 hours of a day.

TASH, GMH and ZMH averages; 6,356, 12,527, and 9,000 deliveries per year (2015 E.C.), respectively, and currently having an average of 25 deliveries per day with a senior gynecologist, resident, and intern on staff to assist with C/S. The study period was December 15, 2024 G.C. – May 31, 2025 G.C.

4.3 POPULATION

4.3.1 SOURCE POPULATION

Comprises of all mothers who have undergone elective and emergency C/S under spinal anesthesia at three teaching hospital of Addis Ababa University during the study period.

4.3.2 STUDY POPULATION

All sampled mothers who have undergone elective and emergency C/S under spinal anesthesia who fulfill the eligibility criteria during data collection.

4.4 INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria

- Use of Spinal Anesthesia for caesarean delivery

Exclusion criteria

- Mothers who had C/S under general anesthesia or need general anesthesia in between the procedure, have complications like active bleeding, failed spinal anesthesia
- Mothers who have been diagnosed with Hypertensive disorders of pregnancy in current pregnancy, pre-existing chronic or recurrent headache, and had previous diagnosis of migraine headache were excluded.
- Mothers who are not willing to participate in the study

4.5. SAMPLE SIZE DETERMINATION AND SAMPLING TECHNIQUE

4.5.1 SAMPLE SIZE DETERMINATION

The sample size for the first objective was determined using single population proportion formula using 42.6 % magnitude of patients developed PDPH (17), 5% of marginal error and 95% confidence interval of certainty (alpha = 0.05).

$$n = z\ 2(\sigma /2)\ p\ (1-p)/d^{\ 2}$$

Where, n = Sample size, Z α = Critical value = 1.96

p = percent of women who undergo caesarean section = 42.6%

D = Precision (margin of error) = 0.05 $n = (1.96)^2\ 0.426(1-0.426)/\ (0.05)^2 = 376$

Adding a non-response rate of 5% = 19

The final sample size was n=395

The sample size was calculated for both single and double population proportion formula using epi-info calc software.

Sample size for first objective							
Variable	Proportion	Confidence level	Margin of error	Sample size	No response	Final sample size	Reference
Post dural puncture headache	42.6%	95%	5%	376	10%	395	(17)
Sample size for the second objective							
Variable	% Of outcome unexposed	% Of outcome exposed	Odd ratio	power	Sample size	10% non-response	Final sample size	reference
Sex of provider	31.8	48.5	1.664	80	558	56	612	26
Large needle size	24.4	37.1	1.623	80	822	82	904	

The final sample size was the sample from the double population proportion, which is 904. Therefore, sample size calculated using single population formula was judged sufficient source to identify magnitude and associated factors post-dural puncture headache.

4.5.2. SAMPLING TECHNIQUE

Simple consecutive sampling technique was used to include study participants until the required sample size is saturated after allocating sample proportionally to the study areas.

4.6. VARIABLES

4.6.1. DEPENDENT VARIABLE

- Postdural puncture headache

4.6.2 INDEPENDENT VARIABLES

- **Socio demographic characteristics –** Maternal Age, BMI, occupation, education status and residency

- **Client related and Obstetric Factors –** Gravidity, parity, gestational age, number of gestations, history of previous C/S, history of spinal anesthesia, previous history of PDPH, pregnancy related medical complication

- **Anesthesia related factor** - Patient position, number of attempts, experience of anesthetists/resident, ASA assessment; Needle: size, shape (blunt, sharp), direction (caudal, cephalic), Hydration prior to anesthesia, success of block, Number of CSF drop/Opening pressure

- **Other factors -** Total blood loss, Type of procedure (Emergency and Elective C/S)

4.6 OPERATIONAL DEFINITIONS

- **Post-dural puncture headache (PDPH)** : It is a headache which may occur with in 5 days of the dura puncture after spinal anesthesia; which is aggravated when standing or sitting and relieved when lying flat; (ICHD - 3rd edition (2018)). Associated symptoms include stiff neck, hearing loss, tinnitus, photophobia, hyperacusis, and nausea.

Severity of PDPH was rated on "numerical rating scale" from 0 to 10 (NRS-11) as mild, moderate, and severe: 0 is the absence of headache; mild pain: 1–3 (nagging, annoying, and interfering slightly with activities of daily living); moderate: 4–6 (interferes significantly with activities of daily living); and severe: 7–10 (disabling; unable to perform activities of daily living). Patients with a headache were evaluated and given standard treatment for the duration of the headache (17).

An 11-point numeric rating scale is a simple tool that tells us the patient's perceived intensity of pain. Patients are given a scale from 0 (no pain) to 10 (worst imaginable pain). Other anchors, such

as ‘worst pain I’ve experienced’, can be used – same anchor was used every time. This is different for every patient and should not be used to compare between patients. However, it is a very good tool to assess response to treatment – at least a 2-point change in the scale is considered clinically meaningful.

Rating	Pain Level
0	No Pain
1 – 3	Mild Pain (nagging, annoying, interfering little with activities of daily living)
4 – 6	Moderate Pain (interferes significantly with activities of daily living)
7 – 10	Severe Pain (disabling; unable to perform activities of daily living)

- ✓ **BMI -** a measure of maternal nutritional status calculated as the ratio of pre-pregnancy weight in kilograms to the square of height in meters**,** expressed in kg/m^2**.**
- ✓ **Blood loss during cesarean section -** Total amount of blood lost from the start of skin incision to completion of surgery**,** including losses from the operative field and surgical sponges described by the operating surgeon.
- ✓ **Pregnancy related medical complication** – Refers to any medical condition that develops or is first recognized during pregnancy or that worsened by the physiological changes of pregnancy and that may affect the outcomes for the mother or fetus or the method of delivery (including cesarean section).

4.8. DATA COLLECTION TOOL AND TECHNIQUES

Data was collected via face-to-face interview, phone call and reviewing the medical chart using structured, pre-tested data collection questionnaire. A structured questionnaire that was adapted from different researches done on spinal puncture headache was used. The questionnaire included post-dural puncture headache related character, sociodemographic character, obstetric related character and anesthesia related character.

Three nurses in each study setting were recruited and trained on data collection procedure. For data collectors and supervisors, relevant two-day training was given by the investigator to make them familiar with the data collection tool, interview technique, eligibility of study subjects, sampling techniques and ethical concern. Five percent of the sample was pre-tested before starting

of the actual data collection period. Data was collected after obtaining oral informed consent (For the face-to-face interview, for obtaining her medical record number to review the medical chart and obtaining her phone number to access the participant for the follow-up question on assessing post-dural puncture headache) from the study participants by the data collectors after being selected by simple consecutive methods during the study period.

Following informed consent and screening for exclusion criteria, each individual participant was requested to respond to the interview in a separate room; in the maternity ward for those cesarean section is being done on elective basis a day prior to their surgery and in the postnatal wards after completion of the surgery for those emergency cesarean sections. The follow-up phone call data was collected after 1 week of the surgery assessing the patient status on PDPH.

Follow-up phone call interview was avoided in those participants who had PDPH prior to their discharge. Participants who were identified to have PDPH, during their stay in the ward or on a phone call interview; they were linked to the respective treating physician for appropriate continuum of care.

Data from anesthesia provider was obtained after informed oral consent taken providing separate information sheet in a separate room in the operation room.

Data collectors were supervised and questionnaire was checked daily for completeness and accuracy to determine the validity to the questionnaire. Any problem that aroused during the data collection process, appropriate intervention was made by the principal investigator.

4.9. DATA QUALITY CONTROL AND MANAGEMENT

The English version questionnaire was translated into Amharic and back translated to English to check its consistency by language experts. The data collectors as well as supervisors were oriented on issue related to the overall data collection procedure. Five percent of the questionnaire (20 questions) were pre-tested at Abebech Gobena Memorial Hospital which was not included in the final sample to check acceptability and consistency two weeks ahead of the actual data collection and necessary correction was taken. The completeness of the questionnaire was checked daily by supervisor and principal investigators. Since no method is used to confirm the responses of the participants, study participants were consented to give the truth by explaining the purpose and importance of the study and assuring the confidentiality of data they provided.

4.10. DATA PROCESSING AND ANALYSIS

With SPSS version 25 software, all of the questionnaires were reviewed, coded, entered, and analyzed. Descriptive statics such as frequency were used for the presentation of independent variable. The independent variables are metric or categorical, so tables and graph was also used for data presentation. Binary logistic regression was used to identify factors associated with post-dural puncture headache on the study participants. Multivariable logistic regression was used to control the possible effects of confounders, and finally the variables which had independent association with post-dural puncture headache was identified on the basis of AOR, with 95% CI and p-value less than 0.25. A model for each outcome variables was created with a fitness test p-value of more than 0.05.

4.11. ETHICAL AND LEGAL CONSIDERATION

Proposal was submitted to the DRPC of Obstetrics and Gynecology department for ethical approval. An official letter of cooperation was written to the three study hospitals to collect data. All the study participants were informed about the purpose of the study using the annexed information sheet (annex 1) for the patient and annex V for the anesthesia provider. Verbal consent was taken at the maternity ward a day prior to their surgery for the elective cesarean sections and for those cesarean sections conducted on an emergency basis at the postnatal ward postoperatively and in the operation room for the anesthesia providers. For the follow-up questionnaire on the assessment of post-dural puncture headache; a phone call was used to address the question where the phone number was collected in the initial interview along with her medical record number for obtaining additional data from her medical charts. Interview was conducted in separate room where privacy is maintained at all times.

Participants were informed about the time interval needed to complete the interview, what the questions were about, and that it was not part of their routine care contact, and that the respondents could refuse participation or terminate their involvement at any time during the interview, and further more; that the information provided by each respondent would be kept confidential. In addition to the report writing not referring a specific respondent. Those who has PDPH were linked to the treating physician (in the postnatal ward or postnatal care clinic) to obtain care.

4.12. DISSEMINATION PLAN

The study result will be presented and submitted to the Department of Gynecology and Obstetrics, Addis Ababa University and Ethiopian Minister of Health. The manuscript of the study will be sent to relevant national and international journals for publication. The copy of the article will be placed in the library of the college of health science, AAU for future reference.

5. RESULT

5.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PATIENT

In this study 904 study participants were involved making the response rate 100%. The most frequent age group in the study was 25–34 years of age, comprising 63.7% of the participants, with a PDPH occurrence of 35.8% amongst them. The most common educational status was secondary education, making up 37.1% of the participants, where 34% of them experienced PDPH. In terms of occupation, housewives made up for the largest percentage of the sample (46.1%), with a PDPH rate of 36.2%. The majority of respondents resided in Addis Ababa, accounting for 89.6% and 38.1% of whom had experienced PDPH. For BMI, the 18.5–24.99 category had the highest representation at 44.8%, with a PDPH rate of 34.6%. Regarding with ASA physical status assessment, the majority were classified as ASA II (77.7%) from the participants, among whom 33.2% developed PDPH.

A statistically significant association was found between age and the incidence of PDPH (χ^2 = 18.78, $p < 0.001$). Educational status also showed a significant relationship ($\chi^2 = 14.5$, $p = 0.002$); where women who were unable to read and write had the highest PDPH rate at 52.3%. BMI was significantly associated with PDPH ($\chi^2 = 16.2$, $p = 0.001$), with the highest rate (53.5%) observed in women with BMI ≥ 30. Furthermore, ASA status demonstrated a strong association ($\chi^2 = 28.4$, $p < 0.001$), as ASA III patients experienced a much higher PDPH rate (56.4%) compared to ASA II patients (33.2%).

Table 1. The sociodemographic characteristics of the study participants among women who delivered by cesarean section in the three teaching hospitals of Addis Ababa University

Variable	PDPH		Total (%)	chi square (p-value
	Yes	No		
Age in years				
17-24	68(31.6)	148(68.4)	215(23.8)	
25-34	106(35.8)	370(64.2)	576(63.7)	18.78(0.000)
≥35	73(64.6)	40(35.4)	113(12.5)	
Religion				
Muslim	106(44.4)	133(55.6)	239(26.4)	
Orthodox	164(35)	305(65)	469(51.9)	1.16(0.764)
Protestant	72(39.3)	111(60.7)	183(20.2)	
Catholic	5(38.5)	8(61.5)	13(1.4)	
Marital status				
Married	326(37.4)	545(62.6)	871(96.3)	

Divorced	6(60)	4(40)	10(1.1)	7.68(0.053)
Single	10(71.4)	4(28.6)	14(1.5)	
Widowed	5(55.6)	4(44.4)	9(1)	
Educational status				
Unable to read and write	23(52.3)	21(47.7)	44(4.9)	
Primary	94(37.9)	154(62.1)	248(27.4)	14.5(0.002)
Secondary	114(34)	221(66)	335(37.1)	
Collage and above	116(41.9)	161(58.1)	277(30.6)	
Occupation				
Housewife	151(36.2)	266(63.8)	417(46.1)	
Government employee	36(35)	67(65)	103(11.4)	9.51(0.050)
Private employee	92(43.2)	121(56.8)	213(23.6)	
Daily laborer	5(31.3)	11(68.8)	16(1.8)	
Merchant	63(40.6)	92(59.4)	155(17.1)	
Husband education (n=854)				
Unable to read and write	0	8(100)	8(0.9)	
Primary	32(31.1)	71(68.9)	103(11.8)	6.01(0.111)
Secondary	98(41.4)	139(58.6)	237(27.2)	
Collage and above	196(37.5)	327(62.5)	523(60)	
Husband occupation				
Government employee	91(40.1)	136(59.9)	227(26.1)	
Private employee	125(35.4)	228(64.6)	353(39)	
Merchant	89(39.9)	134(67.2)	223(24.7)	1.68(0.79)
Daily laborer	21(32.8)	43(67.2)	64(7.3)	
Unemployed	0	4(100)	4(0.5)	
Residency				
Addis Ababa	309(38.1)	501(61.9)	810(89.6)	
Out of Addis Ababa	38(40.4)	56(59.6)	94(10.4)	0.261(0.609)
Monthly income				
<10000	123(38.8)	194(61.2)	317(35.1)	
10000-20000	135(34.3)	259(65.7)	394(43.6)	4.40(0.111)
>20000	89(46.1)	104(53.9)	193(21.3)	
BMI				
<18.5	18(33.3)	36(66.7)	54(6)	
18.5-24.99	140(34.6)	265(65.4)	405(44.8)	
25-29.99	81(33.3)	162(66.7)	243(26.9)	16.2(0.001)
≥30	108(53.5)	94(16.5)	202(22.3)	
ASA status				
ASA II	233(33.2)	469(66.8)	702(77.7)	28.4(0.000)
ASA III	114(56.4)	88(43.6)	202(22.3)	

5.2 OBSTETRICS RELATED CHARACTERISTICS OF THE STUDY PARTICIPANTS

Among the study participants, women with gravidity II–IV were the most common group, accounting for 65.8% of the total participant, with 38.3% of them developing PDPH. This association was statistically significant ($\chi^2 = 6.16$, $p = 0.046$). Similarly, multiparous women (parity 2–4) represented 44.5% of the sample and had a PDPH rate of 43.1%, with parity overall showing a significant relationship with PDPH ($\chi^2 = 11.55$, $p = 0.009$). The majority of cesarean sections were emergency procedures, comprising 63.4% of cases, and among these, 40.8% experienced PDPH — a highly significant association ($\chi^2 = 25.73$, $p < 0.001$). Conversely, elective cesarean sections had a lower PDPH rate of 34.1%. Additionally, among obstetric complications, Gestational Diabetes Mellitus (GDM) was notably associated with a higher PDPH rate of 60.3%, and this relationship was also highly significant ($\chi^2 = 35.3$, $p < 0.001$).

Table 2. Obstetrics related characteristics of the study participants

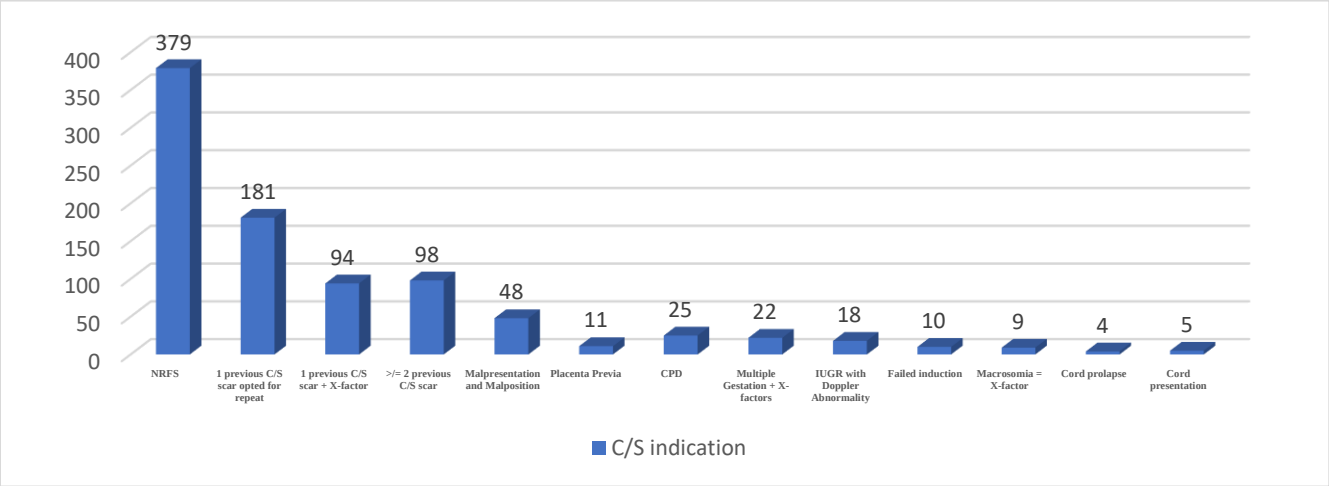
Variable	PDPH		total (%)	Percent (%)
	Yes	No		
Gravidity				
I	97(36.2)	171(63.8)	268(29.6)	
II-IV	228(38.3)	367(61.7)	595(65.8)	6.16(0.046)
≥V	22(53.7)	19(46.3)	41(4.5)	
Gestational age in weeks				
<37	6(23.1)	20(76.5)	26(2.9)	
37-41^{+6}	326(38.8)	515(61.2)	841(93)	2.40(0.301)
≥42	15(40.5)	22(59.5)	37(4.1)	
Interpregnancy interval (n=636)				
<24	97(37.2)	164(62.8)	261(41)	
≥24	153(40.8)	222(59.2)	375(59)	0.220(0.639)
Number of fetuses				
One	322(39)	503(61)	825(91.3)	1.68(0.194)
Two	25(31.6)	54(68.4)	79(8.7)	
History of previous C/S				
Yes	160(44.6)	199(55.4)	359(39.7)	
No	187(34.3)	358(65.7)	545(60.3)	0.43(0.512)
History of medical illness				
Yes	8(32)	17(68)	25(32.8)	
No	339(38.6)	540(61.4)	879(67.2)	0.773(0.379)
Types of medical illness (n=25)				
Overt DM	5(25)	15(75)	20	
Cardiac Illness	3(100)	0	3	2.02(0.568)

RVI on HAART	0	2(100)	2	
Types of C/S				
Elective	113(34.1)	218(65.9)	331(36.6)	
Emergency	234(40.8)	339(59.2)	573(63.4)	25.73(0.000)
Estimated blood loss				
<500	340(38.5)	544(61.5)	884(97.8)	
≥500	7(35)	13(65)	20(2.2)	
Obstetric complication				
Yes	80(38.6)	127(61.4)	207(22.9)	0.94(0.33)
No	267(38.3)	430(61.7)	697(77.1)	
Type of Obstetric Complication (N=207)				
Antepartum hemorrhage			63	
GDM	38(60.3)	25(39.7)	71	35.3(0.000)
IUGR	27(38)	44(62)	14	
Oligohydramnios	5(35.7)	9(64.3)	18	
Post term	3(16.7)	15(83.3)	2	
Preterm labor	0		3	
PROM	7(19.4)	29(80.6)	36	

5.3 INDICATION FOR CAESAREAN SECTION AMONG THE STUDY PARTICIPANTS

The most common indication for the caesarean sections in the study participants were NRFS, accounting for approximately 41.9% of the cases (n=379) followed by a history of one previous C/S scar opting for repeat, representing about 20.02% (n=181), and one previous C/S scar with an X-factors at 10.4% (n=94). Indications such as having two or more previous C/S scars accounted for 10.8% (n=98), while malpresentation and malposition made up for 5.3% (n=48) of cases.

Figure 2. Indication for caesarean section among the study participants



5. 4 THE ANAESTHESIA CHARACTERISTICS OF THE STUDY PARTICIPANTS

Most patients (90.4%) received intravenous/oral hydration prior to anaesthesia, and 37.6% of them developed PDPH. All patients were in the sitting position during spinal anaesthesia (100%). The most commonly used needle gauge was 23G, used in 37.9% of cases, with a PDPH rate of 34.4%. Regarding number of CSF drops, two drops were observed in 52.4% of cases, with a PDPH rate of 39%. the majority had one attempt (337 cases), with a PDPH rate of 20.8%. The most frequent anaesthesia provider group was anaesthetists, performing 86.6% of procedures, with a PDPH rate of 34%.

Patients who did not receive hydration prior to anesthesia had a higher PDPH rate (46%) compared to those who did (37.6%), and this association was statistically significant ($\chi^2 = 4.96$, $p = 0.026$). The number of CSF drops had a strong association with PDPH ($\chi^2 = 45.4$, $p < 0.001$); patients with three drops had the highest PDPH rate (54.1%), while those with one drop had the lowest (18.6%). A significant increase in PDPH from 20.8 percent (one attempt) to 92.4 percent (three attempts) was also observed in the number of attempts ($\chi^2 = 241.4$, $p < 0.001$). The type of anesthesia provider influenced PDPH rates significantly ($\chi^2 = 41.9$, $p < 0.001$), with the highest rates among those treated by anesthesiologists (68.9%) and residents (65%), compared to anesthetists (34%). In contrast, provider experience in years did not show a statistically significant association with PDPH ($\chi^2 = 1.73$, $p = 0.42$).

Table 3. The anesthesia characteristics of the study participants

Variable	PDPH		Total (%)	
	Yes	No		Percent (%)
Intravenous oral hydration prior to anesthesia				**4.96(0.026)**
Yes	307(37.6)	510(62.4)	817(90.4)	
No	40(46)	47(54)	87(9.6)	
Patient position				
Sitting	347(38.4)	557(61.6)	904(100)	
Needle Size in G				8.31(0.040)
25.00	88(46.6)	101(53.4)	119(13.2)	
24.00	147(42.9)	196(57.1)	253(28)	
23.00	87(34.4)	166(65.6)	343(37.9)	
22.00	25(21)	94(79)	189(20.9)	
Types of needle tip				
Cutting	347(38.4)	557(61.6)	904(100)	
Number of CSF drop				45.4(0.000)
1	37(18.6)	162(81.4)	199(22)	
2	185(39)	289(61)	474(52.4)	
3	125(54.1)	106(45.9)	231(25.6)	
Spinal anesthesia success				
Yes	347(38.4)	557(61.6)	904(100)	
Number of attempts				241.4(0.000)
One	70(20.8)	267(79.2)	337	
Two	156(35.8)	280(64.2)	436	
three	121(92.4)	10(7.6)	131	
Anesthesia provider				41.9(0.000)
Anesthetist	266(34)	557(61.6)	783(86.6)	
Anesthesia resident	39(65)	517(66)	60(6.6)	
Anesthesiologist	42(68.9)	21(35)	61(6.7)	
Anesthesia provider experience in years		19(31.1)		1.73(0.42)
<4	137(40.8)	199(59.2)	336(37.2)	
4-8	200(37)	341(63)	541(59.8)	
>8	10(37)	17(63)	27(3)	

5.5 CHARACTERISTICS OF PARTICIPANTS ON HISTORY OF PREVIOUS SPINAL ANESTHESIA AND HEADACHE FOLLOWING THE SPINAL ANESTHESIA

Among all participants, 55.6% had no history of previous spinal anesthesia. However, those with a history of spinal anesthesia had a much higher PDPH rate (50.1%) compared to those without such history (29%). A significant association was observed between prior spinal anesthesia exposure and PDPH occurrence ($\chi^2 = 33.39$, $p < 0.001$). Furthermore, the history of headache

following previous spinal anesthesia was also strongly associated with current PDPH risk (χ^2 = 12.7, $p < 0.001$).

Table 4. Characteristics of participants on history of previous spinal anesthesia and headache following the spinal anesthesia

Variables	PDPH		Total (%)	chi-square(p-value)
	Yes	No		
History of previous S/A				
Yes	201(50.1)	200(49.9)	401(44.4	33.39(0.000)
No	146(29)	357(71)	503(55.6)	
Any headache following the S/A				
Yes	190(56.2)	148(43.8)	338(84.3)	12.7(0.000)
No	11(17.5)	52(82.5)	63(15.7)	

5.6 THE CHARACTERISTICS OF POST-DURAL PUNCTURE HEADACHE

Among the 904 patients who underwent spinal anesthesia, 38.4% (n=347) reported experiencing headaches afterward, while 61.6% did not. Of those who developed headaches, the majority described their pain as mild (76.9%), with fewer reporting moderate (21.9%) or severe pain (1.2%). Most headaches appeared within 1 to 2 days following the dural puncture (72.3%), while 27.7% developed within the first 24 hours. All patients with headaches experienced worsening pain within 15 minutes of sitting or standing, which improved within 15 minutes of lying down. Frequently associated symptoms included neck stiffness (85.9%), tinnitus (38.3%), and rarely nausea (0.6%). The headache was predominantly localized to the front or back of the head (85.9%) and described as throbbing or pulsing by 77.8% of patients, with a small proportion reporting dull aching pain (8.1%).

Table 5. The characteristics of post-dural puncture headache among the study participants

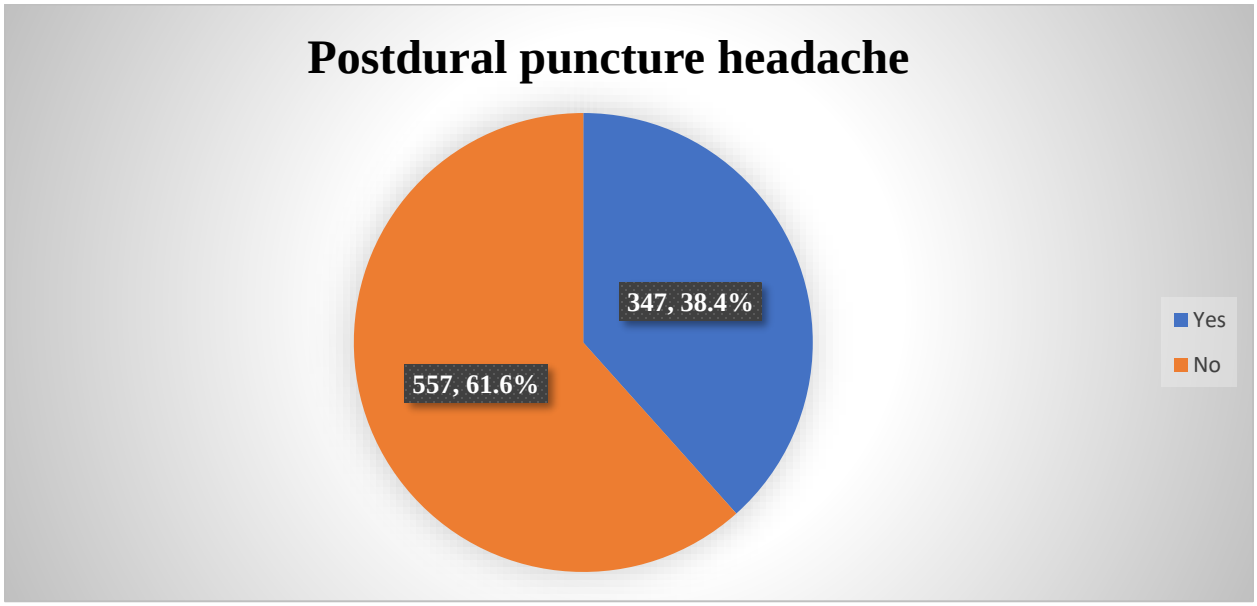
Variable	Frequency (n)	Percent (%)
Any headaches following the spinal anesthesia		
Yes	347	38.4
No	557	61.6
Level of headache(n=347)		
Mild pain	267	76.9
Moderate pain	76	21.9
Severe pain	4	1.2
Headache developed after how many days of dural puncture		

(n=347)		
<24 hrs	96	27.7
1-2 days	251	72.3
Headache worsens within 15 minutes after sitting or standing and improves within 15 minutes after lying down		
Yes	347	100
Any associated symptoms of headache (n=347)		
Neck stiffness pain	298	85.9
Tinnitus	133	38.3
Nausea	2	0.6
Description of type of headache (n=347)		
Front or back of the head	298	85.9
Throbbing/Pulsing pain	270	77.8
Dull aching	28	8.1

5.7 THE PREVALENCE OF POST-DURAL PUNCTURE HEADACHE

The pie chart illustrates the occurrence of PDPH amongst patients who received spinal anesthesia. Of the total patients, 38.4% (n=347) experienced PDPH.

Figure 3. The prevalence of post-dural puncture headache among women delivered by cesarean section



5.8 THE DETERMINANT FACTORS OF POST-DURAL PUNCTURE HEADACHE

The bivariate analysis revealed a statistically significant association between a number of factors and the incidence of PDPH. These includes; age of the patient, educational status, the ASA

physical status assessment, history of previous spinal anesthesia, gravidity, emergency cesarean section, number of CSF drops, number of attempts and provider of the anesthesia.

In the multivariate logistic regression, age ≥35 years remained significantly associated with PDPH (AOR: 2.7; 95% CI: 1.49–4.76; *p*=0.001). ASA class III status continued to be independently associated with a higher risk (AOR: 1.9; 95% CI: 1.25–2.96; *p*=0.003). History of previous spinal anesthesia was also a strong independent predictor (AOR: 3.1; 95% CI: 2.08–4.48; *p*<0.001). Among obstetric factors, high gravidity (≥V) remained significant (AOR: 2.7; 95% CI: 1.79–3.98; *p*=0.293), and undergoing an emergency C-section was associated with 2.7 times greater risk of PDPH compared to elective cases (AOR: 2.7; 95% CI: 1.79–3.98; *p*<0.001).

The technical aspects retained their strong predictive power. Compared to one CSF drop, two drops increased PDPH risk (AOR: 2.3; 95% CI: 1.45–3.77), and three drops tripled the risk (AOR: 3.3; 95% CI: 1.95–5.64; *p*<0.001). Similarly, patients who experienced three puncture attempts had the highest independent risk (AOR: 31.6; 95% CI: 15.29–65.28; *p*<0.001). Compared to anesthetists, spinal anesthesia performed by residents (AOR: 2.8; 95% CI: 1.33–36.24; *p*=0.010) and anesthesiologists (AOR: 6.2; 95% CI: 2.31–17.44; *p*=0.002) were both independently linked to increased PDPH occurrence.

Table 6. The bivariate and multivariate logistic regression of association between PDPH and independent variable among women who gave birth by caesarean section in the three teaching hospitals of Addis Ababa university

Variable	PDPH		p-value	COR with 95% CI	P-value	AOR with 95% CI
	Yes	No				
Age in years						
17-24	68(31.6)	148(68.4)	1		1	
25-34	106(35.8)	370(64.2)	0.277	1.2(0.86, 1.68)	0.566	**11.2(0.75, 1.70)**
≥35	73(64.6)	40(35.4)	0.000	3.9(2.44, 6.38)	0.001	**2.7(1.49, 4.76)**
Educational status						
Unable to read and write	23(52.3)	21(47.7)	0.198	1.5(0.80, 2.88)	0.178	1.7(0.78, 3.85)
Primary	94(37.9)	154(62.1)	0.354	0.85(0.59, 1.20)	0.813	0.95(0.61, 1.48)
Secondary	114(34)	221(66)	0.046	0.72(0.52, 0.99)	0.234	0.78(0.52, 1.17)
Collage and above	116(41.9)	161(58.1)	1			
ASA status						

ASA II	233(33.2)	469(66.8)	1		1	
ASA III	114(56.4)	88(43.6)	0.000	2.6(1.89, 3.59)	0.003	**1.9(1.25, 2.96)**
History of previous S/A						
Yes	201(50.1)	200(49.9)	0.000	2.5(1.87, 3.23)	0.000	**3.1(2.08, 4.48)**
No	146(29)	357(71)	1			
Gravidity						
I	97(36.2)	171(63.8)	1		1	
II-IV	228(38.3)	367(61.7)	0.551	1.1(0.81, 1.48)	0.090	1.9(1.25, 2.96)
≥V	22(53.7)	19(46.3)	0.035	2.1(1.05, 3.96)	0.293	2.7(1.79, 3.98)
Types of C/S						
Elective	113(34.1)	218(65.9)	1		1	
Emergency	234(40.8)	339(59.2)	0.046	1.3(1.01, 1.77)	0.000	**2.7(1.79, 3.98)**
Number of CSF drop						
One	37(18.6)	162(81.4)	1		1	
Two	185(39)	289(61)	0.000	2.8(1.87, 4.19)	0.000	**2.3(1.45, 3.77)**
Three	125(54.1)	106(45.9)	0.000	5.2(3.32, 8.02)	0.000	**3.3(1.95, 5.64)**
Number of attempts						
One	70(20.8)	267(79.2)	1		1	
Two	156(35.8)	280(64.2)	0.000	2.1(1.53, 2.95)	0.000	**2.1(1.41, 2.92)**
Three	121(92.4)	10(7.6)	0.000	16.2(12.99, 22.62)	0.000	**31.6(15.29, 65.28)**
Spinal anesthesia providers						
Anesthetist	266(34)	557(61.6)	1		1	
Anesthesia resident	39(65)	517(66)	0.000	3.6(2.08, 6.26)	0.010	**2.8(1.33, 36.24)**
Anesthesiologist	42(68.9)	21(35)	0.000	4.3(2.45, 7.53)	0.002	**6.2(2.31, 17.44)**

* - Significant COR ** - Significant AOD

6. DISCUSSION

In this study, the incidence of PDPH among patients undergoing spinal anesthesia was 38.4% (n=347), which is relatively high compared to many international studies. This rate is consistent with findings from Ethiopia, such as in Gonder (38.8%) [16] and Bahir Dar (42.6%) [17], but notably higher than those reported in Jordan (6.3%) [1], India (15.3%) [2], and Pakistan (5% in the median approach and 1.6% in the paramedian approach) [5]. Such differences may stem from variations in procedural technique, needle types, study populations, and provider experience across settings.

The majority of PDPH cases developed within 1–2 days after the dural puncture (72.3%), with the remaining 27.7% occurring within the first 24 hours, which aligns with the classical presentation described in the literature [10,11]. All patients in our study reported headaches that worsened upon sitting or standing and improved with lying down typical signs of PDPH associated with CSF leakage and intracranial hypotension [11]. The majority of headaches were described as mild (76.9%), with fewer experiencing moderate (21.9%) or severe pain (1.2%). These proportions are similar to other studies from Ethiopia and Uganda, where mild to moderate headaches were the most common presentations [11,13].

Neck stiffness (85.9%) and tinnitus (38.3%) were the most frequently associated symptoms in our study, with nausea being reported rarely (0.6%). Similar associations have been documented in other studies, suggesting involvement of meningeal and cranial nerve irritation due to decreased CSF pressure [11,21]. The localization of the headache to the front or back of the head in 85.9% of patients, with a throbbing or pulsatile quality reported by 77.8%, mirrors findings from Gambia, where occipital headache was the most common presentation [21].

Age ≥35 years was significantly associated with a higher risk of PDPH (AOR: 2.7; p=0.001), in agreement with studies from the Democratic Republic of Congo and Kenya [19,20]. However, this finding contrasts with those from Pakistan and Gambia, where younger age and low parity were noted as risk factors due to increased dural elasticity and hormonal influences [5,21]. Similarly, ASA class III status was an independent risk factor (AOR: 1.9; p=0.003), possibly due to systemic comorbidities affecting recovery, a factor less commonly explored in previous studies.

A history of previous spinal anesthesia was also significantly associated with increased PDPH risk (AOR: 3.1; p<0.001), consistent with findings from Uganda and Ethiopia, where prior exposure was linked with recurrent headaches due to residual dural weakness or sensitization [11,22].

Among obstetric variables, high gravidity (≥5) and undergoing an emergency cesarean section were significantly associated with PDPH (AOR: 2.7; p<0.001), echoing results from the DRC, where parity and urgent interventions were key predictors [19].

Technical aspects of spinal anesthesia strongly influenced PDPH development. Patients with two or more CSF drops during puncture were at higher risk compared to those with one drop, with three drops increasing the odds more than threefold (AOR: 3.3; p<0.001). This aligns with findings from Gambia, where a higher number of CSF drops was significantly associated with PDPH [21].

The number of puncture attempts was the most significant factor in our study; patients with three attempts had an AOR of 31.6 (p<0.001), in line with multiple studies from Jordan [1], Gonder [16], and Bahir Dar [17], which reported strong associations between repeated puncture attempts and PDPH.

Operator experience was another important determinant. Spinal anesthesia performed by residents (AOR: 2.8; p=0.010) and anesthesiologists (AOR: 6.2; p=0.002) carried significantly higher PDPH risk compared to anesthetists. This is consistent with findings from Kenya and the DRC, where procedures performed by less experienced personnel were more likely to result in complications, including PDPH [19, 20].

7. STRENGTH AND LIMITATION OF THE STUDY

This study has several strengths. It is the first multicenter investigation on the prevalence and associated factors of post-dural puncture headache among obstetric patients in Addis Ababa, thereby filling an important evidence gap in Ethiopia. The study employed a prospective design with an adequate sample size improving the reliability of the findings. With a 100% response rate, validity was further improved by using pretested data collection instruments and standardized diagnostic criteria. Moreover, since the study was conducted across three major teaching hospitals, the results are likely generalizable to similar tertiary care settings in the country.

This study has some limitations that should be considered when interpreting the findings;

- **Self-reported symptoms** – Diagnosis of PDPH relied partly on patient reporting, which may introduce recall bias or subjective variability in symptom description and lacks visual assessment of the status of the participants.
- **Potential confounders** – Some unmeasured variables such as hydration status, analgesia provision, caffeine intake, or lack of objective operator experience level measurement may have influenced the risk of PDPH but were not controlled for.
- **Resource constraints** – Limited availability of atraumatic needles in some settings may have affected both practice patterns and outcomes, possibly underestimating their protective effect.
- **Hospital-based sample** – As the study was conducted only in three teaching hospitals in Addis Ababa, the results may not fully represent other hospitals or rural settings in Ethiopia.

8. CONCLUSION

This study found a 38.4% prevalence of post-dural puncture headache (PDPH) among the study population, showed its significance as a notable complication following spinal anesthesia. Key determinants significantly associated with an increased risk of PDPH included younger age, previous PDPH following spinal anesthesia, high gravidity, emergency cesarean section, multiple cerebrospinal fluid drops, repeated puncture attempts, and anesthesia administered by less experienced providers.

9. RECOMMENDATION

Based on the findings of this study, the following general recommendations are proposed to reduce the incidence of PDPH among women undergoing cesarean section with spinal anesthesia:

- ✓ Minimize the number of puncture attempts by ensuring adequate training, proper positioning, and use of experienced providers for difficult cases
- ✓ Screen women with a history of prior PDPH and counsel them on the increased risk, with consideration for preventive strategies.
- ✓ Implementing clear clinical protocols regarding the number of attempts, CSF drop observation in an attempt to improve consistency in practice and reduce the incidence of PDPH.
- ✓ Future research recommendation
    - Further multicenter or prospective studies to evaluate additional modifiable risk factors.
    - Studies comparing different preventive measures (needle design, gauge, prophylactic hydration, pharmacologic interventions).

10. REFERENCES

1. Magnitude and associated factors of post Dural puncture headache after spinal anesthesia in surgical patients at comprehensive specialized referral hospital, 2021: A multi-center cross-sectional study

2. Khraise WN, Allouh MZ, El-Radaideh KM, Said RS, Al-Rusan AM. Assessment of risk factors for postdural puncture headache in women undergoing cesarean delivery in Jordan: a retrospective analytical study. Local and Regional Anesthesia. 2017 Mar 17:9-13.

3. Badoni S, Bhatt H, Palaria U, Gupta N. Study of the incidence of post dural puncture headache (pdph) and post dural puncture backpain (pdpb) in post cesarean female. Int J Acad Med Pharm. 2023;5(3):1062-5.

4. Dasari S, Udayagiri RS, Shaik KB. Incidence of post-dural puncture headache with median and paramedian approach in cesarean section. Int J Acad Med Pharm. 2024;6(1):1811-6.

5. Genç M, Sahin N, Maral J, Celik E, Kar AA, Usar P, Korkut B, Guclu S. Caesarean section with spinal anesthesia and postspinal headache. American Journal of Obstetric & Gynecologic Research. 2015 Jan 28;1(1):1-7.

6. Firdous T, Siddiqui MA, Siddiqui SM. Frequency of post dural puncture headache in patients undergoing elective cesarean section under spinal anesthesia with median versus paramedian approach. Anaesthesia, Pain & Intensive Care. 2019 Jan 24:165-70.

7. Zulfiqar H, Ghafoor H, Anwar MH, Zahir J, Bokhari FM, Haq IU. Effect of Patient Position during Spinal Anesthesia on the Incidence of Post-Dural Puncture Headache after Cesarean Section. Annals of PIMS-Shaheed Zulfiqar Ali Bhutto Medical University. 2024 Mar 31;20(1):80-5.

8. Bakır M, Rumeli Ş, Özge A, Türkyılmaz GG. The effect of postdural puncture headache on pre-existing and new-onset headaches after cesarean section: A retrospective study. Heliyon. 2022 Oct 1;8(10).

9. Said A, Elmahmoudi H, Elansari A, Elbadri L, Elfakhri S, Alhejaji A. Incidence and Risk Factors of Post Dural Puncture Headache After Spinal Anesthesia in Tripoli Hospitals. AlQalam Journal of Medical and Applied Sciences. 2024 Apr 17:261-9.

10. El–guoshy MM, Stohy ES, Sale HA, Saleh AA, Seliem MM. Clinical Comparative study of the effect of preoperative pregabalin on reduction of the incidence of headache after spinal anesthesia in cesarean section. The Egyptian Journal of Hospital Medicine. 2018 Oct 1;73(4):6507-14.

11. Lamacraft, G. Complications associated with regional.Girma Weji, B., Obsa, M. S., & Melese, K. G. (2020). Incidence and risk factors of postdural puncture headache: prospective cohort study design. Perioperative Medicine. (2004)

12. Girma T, Mergia G, Tadesse M, Assen S. Incidence and associated factors of post dural puncture headache in cesarean section done under spinal anesthesia 2021 institutional based prospective single-armed cohort study. Annals of Medicine and Surgery. 2022 Jun 1;78.

13. Ayub F, Ahmad A, Aslam KZ, Saleem I. Frequency of headache with 25G or 27G quincke needles after spinal anesthesia in patients undergoing elective cesarean section. Anaesthesia, Pain & Intensive Care. 2019 Jan 19:170-3.

14. Ashebir YG, Ashebir YG, Birhanu D. Assessment of Maternal Satisfaction and its Associated Factor After Spinal Anesthesia for Cesarean Section in Debere Markose Comprehensive Specialized Hospital, East Gojjam Zone, an Amhara Region, Ethiopia, From January to June 2023 GC. Journal of Anesthesia & Pain Medicine. 2024 Feb 15;9(1):1-0.

15. Khraise WN, Allouh MZ, El-Radaideh KM, Said RS, Al-Rusan AM. Assessment of risk factors for postdural puncture headache in women undergoing cesarean delivery in Jordan: a retrospective analytical study. Local and Regional Anesthesia. 2017 Mar 17:9-13.

16. Kassa AA, Beyen TK, Denu ZA. Post dural puncture headache (PDPH) and associated factors after spinal anesthesia among patients in University of Gondar Referral and Teaching Hospital, Gondar, North West Ethiopia. J Anesth Clin Res. 2015 Jun;6(536):2.

17. *Assessment of the Prevalence and Associated RiskFactors of Post Dural Puncture Headache (PDPH) afterCesarean Section Delivery under Spinal Anesthesia.* **stegegni, fentahun.** Bahir dar : Journal of Anesthesia & Critical Care: Open Access, 2017.

18. UWIHOREYE C. *Incidence, risk factors and severity of post dural puncture headache in patients who underwent caesarean section in three hospitals in RWANDA* (Doctoral dissertation, University of Rwanda).

19. Iteke RF, Mulewa DU, Mukuku OK. Post-spinal Anesthesia Headaches in Resource-limited Settings: Epidemiological and Clinical Characteristics, Determinants and Predictive Score. of. 2019;6:2.

20. Nduku MA, Jackson O, Wambui M. Factors Predisposing to Postdural Puncture Headache after Spinal Anaesthesia among Elective Caesarean Section Patients at Thika Level 5 Hospital, Kenya. Asian Journal of Medicine and Health. 2023 Oct 31;21(11):202-10.

21. Anyanwu MO, Coker a. Prevalence of Dural Puncture headache after caesarean section at a Tertiary Hospital in the Gambia. medRxiv. 2024:2024-04.

22. Demilew BC, Tesfaw A, Tefera A, Getnet B, Essa K, Aemro A. Incidence and associated factors of postdural puncture headache for parturients who underwent cesarean section with spinal anesthesia at Debre Tabor General Hospital, Ethiopia; 2019. SAGE open medicine. 2021 Oct;9:20503121211051926.

23. Chekol B, Yetneberk T, Teshome D. Prevalence and associated factors of post dural puncture headache among parturients who underwent cesarean section with spinal anesthesia: A systemic review and meta-analysis, 2021. Annals of Medicine and Surgery. 2021 Jun 1;66:102456.

24. Tafesse D, Melkamayew A. Magnitude of post dural puncture headache and associated factors in obstetric mothers undergone spinal anesthesia for caesarean section. J of Anes & Cri Open Access. 2019;11(2):46-50.

25. Shikur B, Marye A, Mesfin E. Spinal anesthesia for cesarean delivery at two teaching hospitals in Addis Ababa, Ethiopia. Ethiop. med. j.(Online). 2018:133-40.

26. Selman Reshad A, Amene A, Nefsu A, Wogayehu A, Abdulkadir K, et al. Incidence and Risk Factors of Post-Dural Puncture Headache Among Adult Non-Obstetric Patients after Spinal Anesthesia at Comprehensive Hospitals of South Nations Nationalities and Peoples Region of Ethiopia: A Modified Poisson Regression. J Anest & Inten care med. 2024; 13(4): 555869. DOI: 10.19080/JAICM.2024.13.555869

ANNEXES

Annex 1: Information sheet for the participants

My name is _____. I am working as a data collector for research by Dr. Tadiwos Mekonnen, who is conducting his research for partial fulfillment of the requirements by the Department of Obstetrics and Gynecology at Addis Ababa University for a specialty Certificate in Obstetrics and Gynecology. This study intends to evaluate the prevalence and associated factors of post-dural puncture headache following spinal anesthesia among women who give birth via cesarean section at the three teaching hospitals of Addis Ababa University during the study period. We would like your honest opinion pertaining to the questions.

Procedure: We are requesting your history, reviewing your chart, and asking your provider about any anesthesia-related procedures in order to evaluate post-dural puncture headache following spinal anesthesia. Apart from these observations and history reviews, no additional procedures or investigations will be performed specifically for this study. We invite you to take part in this research project. If you are willing to participate in our project, you must understand and give your verbal agreement. Then we will ask you to provide a response to the survey on headache-related characteristics with relevant sociodemographic data as well as medical history with a follow-up phone call interview a week after discharge about your health status specifically pertaining to PDPH and also your chart will be reviewed during the course.

Risk and/or Discomfort: By taking part in this research project, you may experience some inconvenience, mainly due to the time required (approximately 15 minutes). However, there are no anticipated risks associated with your participation.

Benefits: Although you may not receive any direct benefit from participating in this research project, your contribution will help improve future approaches to the prevention and management of post-dural puncture headache. No incentives or payments will be provided for your participation.

Confidentiality and Anonymity: The information we gather from this research project will be kept confidentially. The information about you that is collected from the study will be stored in a file that will not bear your name, but the code number that has been assigned to it. It will be disclosed to no one but the principal investigator.

Right to Refuse or Withdraw: You have the right to refuse to participate in this survey (you may choose not to answer some or all questions) if you do not wish to take part in this survey, this will not affect the medical treatment you receive in any healthcare facility. You also have the full right to leave this study whenever you wish without losing your rights as a client of this establishment.

Persons to contact: You are welcome to contact us at any time; if you have any questions.

Name*: -* Dr. Tadiwos Mekonnen

Phone number: 0912275960

Email: tadmekonnen96@gmail.com

Annex 2: Information sheet for the participants (Amharic Version)
እዝል - የተሳታፊዎች የመረጃ ወረቀት

ስሜ _____ እኔ የምሰራው በዶ/ር ታዲዮስ መኮንን በሚያካሂዱት የምርመር ስራ ውስጥ በመረጃ ሰብሳቢነት ሲሆን ዶ/ር ታዲዮስ የምርምር ስራቸውን የሚሰሩት ለማህፀን ሕክምና ስነ ተዋልዶ ያልተሟላ የምርምር ስራ ለልዩ ሰርተፊኬት አስፈላጊነት ነው። ይህም ምርምር ዓላማ ያደረገው በማሕበረሰብ ውስጥ በመስፋፋት ላይ ባለው ውጤት እና ከጀርባ አጥንት ማደንዘዣ በኋላ የሚመጣን የፓስቶራል ፓንቸር ራስ ምታት ማዕከላዊ ያደረገ ነው። ይህም በአዲስ አበባ 3 የማስተማሪያ ሆስፒታሎች የተከናወነ ነው። በዩኒቨርስቲው በመውለድ ላይ ባሉ ሴቶች የካስሪያን ቦታ በአዲስ አበባ ዩኒቨርስቲ 3 ሆስፒታሎች ውስጥ ነው። በጥያቄው ላይ ያለህን ታማኝ ሐሳብ እንድትገልፅ እንፈልጋለን።

ሂደት፤ ከጀርባ አጥንት ማደንዘዣ በኋላ የሚመጣ የኮስት ዱራል አንጃ የራስ ምታትን ለማሰስ የመጀመሪያ የሕክምና ታሪክን፣ የማጠቃለያ ሰንጠረዥን እና ስለ ማደንዘዣው የተያያዙ ሌሎች ፕሮሲጀሮችን ከአቅራቢ ላይ እንፈልጋለን። ከመጠየቅም ባለፈ ያንተን የሕክምና አካሄድ መመልከት እና መገምገም የሕክምና አካሄድ እና ታሪክን ጭምር ማወቅ አለብን። ለዚህም ጥናት ሲባል ምንም አይነት የመገምገሚያ አካሄድ አንጠቀምም። የዚህን የምርምር ፕሮጀክት እንድትሳተፍ እንጋብዝሀለን። በእኛም ፕሮጀክት ውስጥ ለመሳተፍ ፈቃደኛ ከሆንክ መረዳት እና የቃል ማስተባበያ መስጠት ይኖርብሀል፣ ከዚያም ለአንተ የመረጃ ለሰብሳቢዎች ጥያቄ መልስ እንሰጣለን። ይኸውም ስለ ራስ ምታት እና የእራስ ምታት ባህሪዎችን በተመለከተ ከሕመሙ ጋር ተያያዥነት ያላቸውን የሕመም ማስታገሻዎች እና ሌሎች ታሪኮችን በዚያን ሰዓት የነበሩ እና የአንተን ሰንጠረዥ ጭምር በወቅቱ ይገመገማል ይታያል።

ጉዳት እና አለመስማማት፡- እዚህ የምርምር ፕሮጀክት ውስጥ በመሳተፍ ምንአልባትም ያለመመቸት ስሜት በተለይም ጊዜን በማባከን (ከ40 ደቂቃ በላይ) አለበለዚያም ምንም ዓይነት ጉዳት በዚህ ምርምር ፕሮጀክት ውስጥ መሳተፍ ላያመጣ ይችላል።

ጥቅማ ጥቅሞች፡- በዚህ የምርምር ፕሮጀክት ውስጥ ስትሳተፍ በቀጥታ የምታገኘው ጥቅም ላይኖር ይችላል። ተሳትፎ ምን አልባት ለወደፊት ለሚደረገው ጥራትን መሠረት ያደረገ የፓስቶራል ፓንች ራስ ምታት መከላከያ እና አስተዳደር የሚጠቅም ይሆናል። በዚህ ተሳትፎ ምንም ዓይነት ጉርሻ ሆነ ጥቅም በፕሮጀክት ውስጥ ስትሳተፍ ላታገኝ ትችላለህ።

ምስጢር እና ተጠባቂነት፡- ከዚህ የምርምር ፕሮጀክት የምንሰበስባቸው መረጃዎች በሙሉ በምስጢር የተጠበቁ ናቸው። ስላንተም በተመለከተ ከጥናቱ የሚሰበሰበው መረጃ ለሕይወት ዘመን ይቀመጣል። ያንት ስም በላዩ ላይ አይኖርም። ነገር ግን ላንተ የተሰጠው የኮድ ቁጥር ይፃፍበታል። ለማንም ሰው ከዋናው መርማሪ ውጭ አይሰጥም።

የመውጣት ወይም እምቢ የማለት መብት፡- ከምርምር ስራ ውስጥ የመውጣትም ሆነ ራስህን የመከልከል መብት ሲኖርህ (ለተወሰኑ ጥያቄዎች መልስ አለመመለስ) መሳተፍ ካልፈለክ ይህን ያንተን ጤና የሚጐዳ ነገር ያንተን አገልግሎት የሚያቋርጥ ነገር የለውም። በማንኛውም ሰዓትም አንተን ከምርምሩ የማስወጣት ሙሉ መብት እንደፍላጐታችን ይኖረናል። ይህን ስናረግ ያንተን የደንበኛችንን ማንኛውም መብት እና አገልግሎት ሳናሳጣ ይሆናል።

ተጠሪዎች፡- ማንኛውንም ጥያቄ ቢኖርህ ዶ/ር ቴዎድሮስ መኮንን በአካልም ሆነ በስልክ በማንኛውም ሰዓት ማናገር ትችላለህ።

ስልክ: 0912275960

Annex 3: Consent form of the participants

I have been fully informed about this study and given written information and understand that it was intended to do just that. I also understand that the outcome will help to enhance the quality of health care associated with post-dural puncture headache. I am aware that there are no risks involved in taking part in this research. I consent to taking part in this research. I understand that I will not be entitled to any special services or be paid or given any gifts for my participation. I was assured that the data collected would be kept private. I am aware that any report or publication will not include any information that could be used to identify me. This authorization is only valid for this study.

Are you willing to participate in the study? 1- Yes 2 - No

If the answer's yes, thank you! Conduct the interview. If the answer's no, thank you!

Do not force or coerce individuals to participate in surveys

Interviewer's code --------- Name ---------- Signature -------

Date of interview ---------- Date ---------- Month/2024/2025 G.C

Time of interview began _____ hours: minutes

Time of interview finished_____ hours: minutes

Checked on ---------- Date---------- Month/2024/2025 G.C

Complete 1 _____

Incomplete 2 _____ Other (specify) ----

Annex 4: Consent form of the participants (Amharic Version)
እዝል - የተሳታፊው ሐሳቦች

እኔ ስለዚህ ምርምር እና በፅሑፍ ስለቀረበልኝ ሐሳብ በሙሉ እና ዓላማው መረዳቴን አሳውቃለን። በተጨማሪም የምርምሩ ውጤቶች ለፓስቶጆራል ፓንቸር ራስ ምታት ጠቃሚ እንደሆኑ ተረድቻለሁ። በዚህ ጥናት ውስጥም መሳተፍ ምንም ዓይነት ጉዳት እንደማያደርስ ተረድቻለሁ። በዚህ ጥናትም ለመሳተፍ ፈቃደኛ ነኝ። በዚህ ጥናት ውስጥም ለመሳተፍ ምንም ዓይነት ጥቅምም ሆነ ክፍያና ስጦታ እንደማላገኝ በውል ተረድቻለሁ። እንደተነገረኝም በጥናቱ ውስጥ የሚገኙ መረጃዎች በሙሉ በምስጢር መያዝ እንዳለባቸው ተነግሮኛል። በእኔ የሚደረጉ ጥናት የእኔን ስም እንደማይጠቅሱ እና ማንነቴንም መግለፅ እንደማይችሉ በሪፖርትም ላይ በስሜ እንደማይታተም ተረድቻለሁ። ይህ ሥልጣን የሚሰራው ለጥናቱ ጊዜ ብቻ ነው።

በጥናቱ ውስጥ ለመሳተፍ ፈቃደኛ ነህ? 1. አዎ 2. አይደለም

መልስህ አዎ ከሆነ አመሰግናለሁ፣ ቃለመጠይቁን መውሰድ ትችላለህ። መልስ አይደለም ከሆነ አመሰግናለሁ። ማንኛውንም ሰው ወደዚህ ጥናት እንዲመጣ በግድ አንገፋውም።

የቃለመጠይቅ አድራጊዎች ኮድ ..... ስም ..... ፊርማ .....

የቃለመጠይቁ ..... ቀን ወር/2017 ዓ.ም

የቃለመጠይቁ የሚጀምርበት ሰዓት ..... ሰዓት ደቂቃ

ቃለመጠይቁ የሚያልቅበት ሰዓት ..... ሰዓት ደቂቃ

የታየበት ..... ቀን .....ወር /2017 ዓ.ም

ያለቀ 1

ያላለቀ 2 ሌሎች (ይዘርዘር)

Annex 5: English version questionnaire

Instruction: For each of the following questions, please circle the number of alternative(s) that fit the response or fill the blank space!

Section I: Socio-demographic characteristics of the patient

S.No	Characters	Options	If no, skip to
101	Age	1. ____ year	
102	What is your religion	**1.** Orthodox **2.** Muslim **3.** Catholic **4.** Protestant **5.** Others (Specify)…	
103	What is your current marital status?	**1.** Married **2.** Single **3.** Widowed **4.** Divorced 5. Others	
104	What is your educational status?	1. Unable to read and write 2. Able to read and write without formal education 3. Primary school (Grade 1-8) 4. Secondary School (Grade 9-12) 5. Beyond secondary school (College and above)	

105	What is your Current occupation?	1. House wife 2. Daily laborer 3. Merchant 4. Government employee 5. Private employee 6. Other (specify)……..	
106	What is your husband's educational status?	1. Unable to read and write 2. Able to read and write without formal education 3. Primary school (Grade 1-8) 4. Secondary School (Grade 9-12) 5. Beyond Secondary School (College and above)	
107	What is your Husbands Current occupation?	1. Unemployed 2. Daily laborer 3. Merchant 4. Government employee 5. Private employee 6. Other (specify)……..	
108	What is your average monthly household income?	---------- Ethiopian Birr	
109	What is average monthly income of your husband?	---------- Ethiopian Birr	
110	Residency	1. Addis Ababa 2. Outside Addis Ababa	
111	BMI	1. _____ Kg/m2	
	Height	2. _____ m	
	Weight	3. _____ Kg	

104	ASA status	1. ASA II 2. ASA III 3. ASA IV 4. ASA V	

Section II: Questions about previous spinal anesthesia, if any;

S. No	Questions	Options	If No, Skip to
201	History of previous S/A?	1. Yes 2. No	
202	If yes, any headache following the S/A?	1. Yes 2. No	

Section III: Obstetrics History

401	Gravidity	_____	
402	Parity	_____	
403	Number of alive birth	_____	
404	Inter pregnancy interval	……. Months	
405	Gestational Age	…… Weeks ____ Days	
406	Number of Fetus		

407	History of previous C/S (including any uterine scar)	1. Yes 2. No	
408	History of Chronic medical illness	1. Yes (Specify)_____list it 2. No	
409	Obstetric Complication	1. Yes 2. No	
410	Type of Obstetric Complication	1. Preeclampsia/Eclampsia 2. Antepartum Hemorrhage 3. PROM 4. Scar dehiscence 5. Uterine Rupture 6. Other ……(specify)	
411	Was she given intra vein/per oral hydration prior to anesthesia	1. Yes 2. No	
412	Dose spinal anesthesia successful block after administration	1. Yes 2. No	
413	Estimated blood loss	_____ml	
414	Type of C/S	1. Elective 2. Emergency	

Section III – Questions about the presence of PDPH From current Spinal Anesthesia; Patient Interview at the Postnatal Clinic

S. No	Questions	Answer	
301	Any headache following S/A?	1. Yes 2. No	If No; Skip
302	If yes, which level of headache you had		
A	Mild Pain (nagging, annoying, interfering little with Activities of daily living)		
B	Moderate Pain (interferes significantly with Activities of daily living)		
C	Severe Pain (disabling; unable to perform Activities of daily living)		
302	If yes for 401, Head ache develops within 3days after Dural puncture happened?	1. Yes 2. No	
303	Headache worsens within 15 minutes after sitting or standing and improves within 15 minutes after lying down	1. Yes 2. No	
304	Which one of the following associated symptoms present? (Multiple answer is possible)	1. Neck stiffness 2. Tinnitus 3. Photophobia 4. Nausea 5. None of the above	
305	PDPH (yes for 301, 302, 303, and at least one associated symptom from 304)	1. Yes 2. No	

Annex 6: Amharic version questionnaire

መመሪያ፡- ለሚቀጥሉት እያንዳንዱ ጥያቄዎች ከተሰጡት አማራጮች ትክክለኛውን አክብብ(ቢ) (ትክክለኛ የሆነውን እና ባዶ ቦታውን የሚሞላውን አክብብ(ቢ)

ክፍል 1፡- የታካሚው ማሕበረሰባዊ ባህርይ

ተ.ቁ	ባህርይ	ሌላ መንገድ	ከሌለ እለፉት
101	ዕድሜ	1. ….. ዓመት	
102	ሐይማኖትህ ምንድን ነው?	1. ኦርቶዶክስ 2. ሙስሊም 3. ካቶሊክ 4. ፕሮቴስታንት 5. ሌሎች (ይዘርዘር)	
103	የጋብቻ ሁኔታ እንዴት ነው?	1. ያገባ 2. ነጠላ 3. የተፋታች 4. የተፋታ 5. ሌሎች	
104	የትምህርት ደረጃ ምንድን ነው?	1. ማንበብ እና መፃፍ አልችልም 2. ማንበብ እና መፃፍ እችላለሁ ግን ከመደበኛ ትምህርት ውጭ 3. 1ኛ ደረጃ (ከክፍል 1 እስከ 8) 4. 2ኛ ደረጃ ትምህርት ቤት (ከክፍል 9 እስከ 12) 5. ከ2ኛ ደረጃ ትምህርት በላይ (ኮሌጅ እና ከዚያ በላይ) *ከ2ኛ ደረጃ ትምህርት በላይ (ኮሌጅ እና ከዚያ በላይ)	
105	የአሁን የስራ ሁኔታ	1. የቤት እመቤት 2. የቀን ሰራተኛ 3. ነጋዴ	

		4. የመንግስት ተቀጣሪ 5. የግል ተቀጣሪ 6. ሌሎች (ይዘርዘር)	
106	የባልሽ የትምህርት ደረጃ	1. ማንበብ እና መፃፍ አይችልም 2. ማንበብ እና መፃፍ ይችላል ግን ከመደበኛ ትምህርት ውጭ 3. 1ኛ ደረጃ (ከክፍል 1 እስከ 8) 4. 2ኛ ደረጃ ትምህርት ቤት (ከክፍል 9 እስከ 12) 5. ከ2ኛ ደረጃ ትምህርት በላይ (ኮሌጅ እና ከዚያ በላይ)	
107	የባለቤትሽ የአሁን ስራ	1. ስራ አጥ 2. የቀን ሰራተኛ 3. ነጋዴ 4. የመንግስት ተቀጣሪ 5. የግል ተቀጣሪ 6. ሌሎች (ይዘርዘር)	
108	ወርሃዊ የቤት ገቢ ስንት ነው?	…….. የኢትዮጵያ ብር	
109	የባለቤትሽ የወርሃዊ ገቢ ስንት ነው?	…….. የኢትዮጵያ ብር	
110	የመኖሪያ አድራሻ	1. አዲስ አበባ 2. ከአዲስ አበባ ውጭ	
111	ቢኤም1	1…….. ኪግ/ሜ^3	
	ቁመት	2…… ሜ	
	ክብደት	3……. ኪግ	
104	የኤስኤ ሁኔታ	1. ኤስኤ II 2. ኤስኤ III 3. ኤስኤ IV 4. ኤስኤ V	

ክፍል 2፡- በቀድሞ የጀርባ አጥንት ማደንዘዣ ሁኔታ ጥያቄዎች ካለ

ተ.ቁ	ጥያቄዎች	ምላሾች	ከሌለ እለፉት
201	የቀድሞ የጀርባ አጥንት ማደንዘዣ ታሪክ	1. አዎ 2. አይደለም	
202	አዎ ካልሽ የጀርባ አጥንተ ማደንዘዣውን ተከትሎ የሚመጣ ራስ ምታት	1. አዎ 2. አይደለም	

ክፍል 3፡- የማሕፀን ሕክምና ታሪክ

401	መፀነስ		
402	እኩልነት		
403	በሕይወት ያሉ የተወለዱ ልጆች		
404	በእርግዝና መካከል ያለ ርቀት	---ወራት	
405	የማጥባት ጊዜ	----ሳምንታት --- ቀናት	
406	የፅንስ ብዛት		
407	የቀድሞ የሲኤስ ታሪክ (ማንኛውንም ከመሸኛ አካላት ጋር የተያያዘ)	1. አዎ 2. አይደለም	
408	የጠንካራ ሕመም ታሪክ	1. አዎ (ይዘርዘር) 2. አይደለም	
409	የፅንስ ችግር	1. አዎ 2. አይደለም	
410	የታዩ የፅንስ ችግር ዓይነቶች	1. ፕሪክላምሲያ /ኢክለምሲያ 2. ቅድመ ወሊድ ፈሳሽ 3. ፒአርኦኤም 4. ጠባሳዎች መክፈት 5. የማሕፀን መሰንጠቅ 6. ሌሎች /ይዘርዘር	
411	በደም ስር ውስጥ የሚሰጥ መድሐኒት ወይም በአፍ የሚሰጥ መድሐኒት ማደንዘዣውን በምትወስድ ሰዓት ወስዳለች?	1. አዎ 2. አይደለም	

412	የጀርባ አጥንት ማደንዘዣ ሙሉ በሙሉ ከሕክምና በኋላ ተዘግቷል	1. አዎ 2. አይደለም	
413	የፈሰሰው ደም በግምት	ሚሊ ሌትር	
414	የሲ/ኤስ ዓይነቶች	1. የተመረጠ 2. ድንገተኛ	

ክፍል 3፡- ካለው የጀርባ አጥንት ማደንዘዣ በኋላ የፒዲፒኤች መኖር ጥያቄዎች፡- ታካሚው በፖስቴኔቲካል ክሊኒክ የታካሚው ቃለመጠይቅ

ተ.ቁ	ጥያቃዎች	መልሶች	ከሌለው እለፈው
301	ኤስ/ኤ ተከትሎ የተከሰተ ማንኛውም ራስ ምታት	1. አዎ 2. አይደለም	
302	አዎን ከሆነ ምን ያህል መጠን ያለው ራስ ምታት		
U	ቀለል ያለ ሕመም የሚሰነፍጥ የሚያዞር ጥቂት በቀን ተቀን እንቅስቃሴ ውስጥ የሚያስቸግር		
ለ	መካከለኛ ሕመም፡- በከፍተኛ በቀን ተቀን እንስቃሴ ውስጥ አስተዋፅኦ ያለው		
ሐ	ከፍተኛ ሕመም፡- የቀን ተቀን እንቅስቃሴ እንዳታከናውን የሚከለክል		
302	ለ401 መልስ አዎን ከሆነ የራስ ምታት ዱራል ፓንቸር በተከሰተ በሦስተኛው ቀን የሚመጣ ነው?	1. አዎ 2. አይደለም	
303	ከመቀመጥ ወይም ከመቆም በፊት በ15 ደቂቃ ውስጥ የሚከሰት የራስ ምታት እና ስንተኛ በ15 ደቂቃ ውስጥ የሚጠፋ?	1. አዎ 2. አይደለም	
304	ከሚከተሉት የትኛው ምልክት በቤተሰብ ላይ ይታያል (ብዙ መምረጥ ይቻላል)	1. የአንገት መጠንከር 2. መንቋቋት 3. የፀሐይ ጨረር አለመስማማት 4. ማቅለሽለሽ	

		5. ከተዘረዘሩት ውስጥ የለም	
305	የፒዲፒኤች ሁኔታ ከ301፣ 302፣ 303 እና በጥቂቱ ከዚህ ጋር ተያያዥነት ያላቸው ምክንያት ከ304 ውስጥ ካለ	1. አዎ 2. አይደለም	

ANNEXES

Annex 1: Information sheet for the anesthesia provider

My name is _____. I am working as a data collector for research by Dr. Tadiwos Mekonnen, who is conducting his research for partial fulfillment of the requirements by the Department of Obstetrics and Gynecology at Addis Ababa University for a specialty Certificate in Obstetrics and Gynecology. This study intends to evaluate the prevalence and associated factors of post-dural puncture headache following spinal anesthesia among women who give birth via cesarean section at the three teaching hospitals of Addis Ababa University during the study period. We would like your honest opinion pertaining to the questions.

Procedure: In order to assess post-dural puncture headache after spinal anesthesia, we will take a consent from the mother regarding acquiring information for the study while she is stable to provide one. If you are willing to be part of our project, you must understand and give your verbal consent. Then will be asked to provide a response to the data collectors on questions related to the anesthesia procedure.

Risk and/or Discomfort: By taking part in this research project, you may experience some inconvenience, mainly due to the time required (approximately 15 minutes). However, there are no anticipated risks associated with your participation.

Benefits: Although you may not receive any direct benefit from participating in this research project, your contribution will help improve future approaches to the prevention and management of post-dural puncture headache. No incentives or payments will be provided for your participation.

Confidentiality and Anonymity: The information that we will collect from this research project will be kept confidential and only used for this research. Information about you and your patient that will be collected from the study will be stored in a file, which will not have a name on it, but a code number assigned to it. It will not be revealed to anyone except the principal investigator.

Right to Refuse or Withdraw: You have full right to refuse participating in this research (you can choose not to respond to some or all of the questions) if you do not wish to participate, this will not be used for grading evaluation. You have also the full right to withdraw from this study at any time you wish to, without losing any of your rights of your position in the facility.

Persons to contact: You are welcome to contact us at any time; if you have any questions.

Name*:* - Dr. Tadiwos Mekonnen

Phone number: 0912275960

Email: tadmekonnen96@gmail.com

Annex 2: Consent form of the anesthesia provider

I have read and understood the information provided about this study and am fully informed of its purpose. I recognize that the findings may contribute to improving the management and quality of life related to post-dural puncture headache. I understand that there are no anticipated risks involved in participating. I voluntarily agree to take part in this research, knowing that I will not receive any special treatment, payment, or gifts for doing so. I have been assured that all information collected will remain confidential and that no identifying details about me will appear in any reports or publications. This consent applies solely to this specific study.

Are you willing to participate in the study? 1- Yes 2 - No

If the answer's yes, thank you! Conduct the interview. If the answer's no, thank you!

Do not force or coerce individuals to participate in surveys

Interviewer's code --------- Name ---------- Signature -------

Date of interview ---------- Date ---------- Month/2024/2025 G.C

Time of interview began _____ hours: minutes

Time of interview finished_____ hours: minutes

Checked on ---------- Date---------- Month/2024/2025 G.C

Complete 1 _____

Incomplete 2 _____ Other (specify) ----

Annex 3: English Version Questionaries for Anesthesia provider

S. No	Questions	Options	If No, Skip to
101	Patient Position?	1. Sitting 2. Lateral	
102	Needle size?	1. ___ G	
103	Type of needle tip part	1. cutting 2. Pencil point 3.other	
104	Number of attempts	_____	
105	Successful?	1. Yes 2. No	
106	No of CSF drop	_____	
107	Who gave the spinal anesthesia	1.By student anesthetist 2. By qualified anesthetist 3. By Anesthesia Resident 4. By Anesthesiologist	
108	Time of experienced	_____	