COLLEGE OF HEALTH AND MEDICAL SCIENCES

SCHOOL OF GRADUATE STUDIES

PREVALENCE AND FACTORS ASSOCIATED WITH HYPOTENSION AFTER SPINAL ANESTHESIA DURING CESAREAN SECTION AT PUBLIC HOSPITALS IN HARAR TOWN, ETHIOPIA.

POST GRADUATE ANESTHESIOLOGY CRITICAL CARE AND PAIN MEDICINE RESEARCH THESIS

By MENGISTU CHALIE FENTIE (MD)

FEBRUARY, 2025

HARAR, ETHIOPIA

Prevalence and Factors Associated with Hypotension after Spinal Anesthesia during Cesarean Section at Public Hospitals in Harar Town, Ethiopia.

A Thesis to be submitted to the School of Medicine

School of Post-Graduate Studies

Haramaya University

In Partial Fulfillment of the Requirement for Specialty Certificate in Anesthesiology, Critical Care and Pain Medicine.

By Mengistu Chalie Fentie (MD)

College: Health and Medical Sciences

Program: Anesthesiology, Critical Care and Pain Medicine

Major Advisor: Dr. Awoke Getiye (Assistant Professor of ACCPM)

Co-Advisor: Abebe Tolera (Assistant Professor of Epidemiology)

February, 2025

Harar, Ethiopia

APPROVAL SHEET

HARAMAYA UNIVERSITY

SCHOOL OF GRADUATE STUDENTS

I hereby certify that I have read and evaluated this thesis entitled **"Prevalence and Factors Associated with Hypotension after Spinal Anesthesia during Cesarean Section at Public Hospitals in Harar Town, Ethiopia":** prepared under my guidance by Mengistu Chalie (MD). I recommend that it can be submitted as fulfilling the thesis requirement.

1. Awoke Getiye (MD, Assistant Professor of Anesthesiology Critical Care and Pain Medicine

Major advisor	**Signature**	**Date**

2. Abebe Tolera **(MPH, Assistant Professor)**

Co-advisor	**Signature**	**Date**

As a member of the board of examiners of the post-graduate Open thesis defense examination, I certify that I have read and evaluated the thesis prepared by Mengistu Chalie (MD) and examined the candidate. I recommend that the thesis should be accepted as fulfilling the thesis requirement For Specialty Certificate in Anesthesiology Critical Care and Pain Medicine.

Chair Person	Signature	Date
Internal Examiner	Signature	Date
External Examiner	Signature	Date

Final approval and acceptance of the Thesis are contingent upon the submission of its final copy to the Council of Graduate Studies (CGS) through the candidate's department or school graduate committee (DGC or SGS)

STATEMENT OF THE AUTHOR

By my signature below, I declare and affirm that this thesis is my work. I have followed all ethical and technical principles of scholarship in the preparation, data collection, data analysis and compilation of this thesis. Any scholarly matter that is included in the thesis has been given recognized through citation.

This thesis is submitted in partial fulfilment of the requirements for a Post Graduate Anesthesiology Critical Care and Pain Medicine at Haramaya University. The thesis will be deposited in the Haramaya University Library and is made available to borrowers under the rules of the Library. I solemnly declare that this thesis has not been submitted to any other institution anywhere for the award of any academic degree, diploma or certificate

Brief quotations from this thesis may be made without special permission provided that accurate and complete acknowledgement of the source is made. Requests for permission for extended quotations from or reproduction of this thesis in whole or in part may be granted by the head of the school or department when in his or her judgment the proposed use of the material is in the interest of scholarship. In all other instances, however, permission must be obtained from the author of the thesis.

Name: By Mengistu Chalie (MD)

Signature_____

Date_____

School/Department: Medicine

BIOGRAPHICAL SKETCH

My name is Mengistu Chalie Fentie. I was born on December 30, 1992, in Merawi town, North Mecha Woreda, West Gojam Zone, Amhara Regional State, Ethiopia. I attended my primary education at Rim primary school and; secondary, and preparatory education at Merawi Town until 2010.

I joined Bahir Dar University in 2010 and graduated with Doctor of Medicine in 2016. I have served as General practitioner in Chagni primay Hospital and Debre Tabor Comprehensive Specialized Hospital From 2017 - 2022. After 5 year, I enrolled to attend my Residentship in Anesthesia, Critical care and Pain Medicine in March 2022.

ACKNOWLEDGMENTS

I want to extend my deepest gratitude to the Haramaya University College of Health and Medical Sciences, School of Medicine, Department of Anesthesiology, Critical Care, and Pain Medicine for allowing me to conduct this research. My sincere thanks go to my advisors, Abebe Tolera and Dr. Awoke Getiye, for their unwavering support and guidance throughout the synthesis of this thesis. Your expertise and encouragement have been invaluable to my work.

I am also profoundly grateful to all the data collectors who dedicated their time and effort to gather the essential information for this thesis. Your hard work and commitment are deeply appreciated. Lastly, I acknowledge the invaluable support of Hiwot Fana Specialized University Hospital and Jugol General Hospital. Your cooperation and assistance have been crucial to the success of this thesis.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

AOR	Adjusted Odds Ratio
ASA	American Society of Anesthesiology
BMI	Body Mass Index
BSc	Bachelor of Science
C/S	Cesarean Section
CI	Confidence Interval
COR	Crude Odd Ratio
CSF	Cerebrospinal Fluid
GA	General Anesthesia
HTN	Hypertension
LA	Local Anesthetic
OR	Odds Ratio
SA	Spinal Anesthesia
SBP	Systolic Blood Pressure
SIH	Spinal Induced Hypotension
SPSS	Statistical Packages for Social Science

ABSTRACT

Background: Spinal anesthesia is a type of regional anesthesia that has been practicing for obstetric anesthesia since the beginning of the 20th century. Despite the simplicity and lower maternal mortality risk, compared to general anesthesia, spinal anesthesia is linked to different adverse effects, of which hypotension is the most common complication. There is scarcity of comprehensive data on hypotension during spinal anesthesia and its associated factors in this study area.

Objective: This study aimed to determine the prevalence and factors associated with spinal anesthesia induced hypotension during cesarean section at Hiwot Fana Specialized University Hospital and Jugal General Hospital, Harar, Ethiopia November 20, 2024- January 20, 2025.

Method: An institution-based cross-sectional study was used among 389 mothers who underwent cesarean section. A simple random sampling technique was applied to select the study participants. Data were collected using a pre-tested structured questionnaire supplemented with a review of medical records. Data were entered using Epi-Data 3.1 and analyzed using SPSS 26. Both bivariable and multivariable logistic regression analysis was employed to identify factors associated with outcome variable. All variables, with P-value less than 0.3 in bivariable analysis were included for multivariable logistic regression analysis.The level of statistical significance was declared at $p<0.05$. Strength of association was described with AOR along with 95% confidence interval.

Result: A total of 388 (with 99.7% response rate) data were analyzed. The mean age of the mothers were 27.58 (±4.21SD) years. The prevalence of hypotension among mothers who underwent a cesarean section after spinal anesthesia was 59.28% (95% CI; 54.4-64.20). Newborn weight of ≥2.5 kg (AOR = 6.89; 95% CI: (2.986-15.907), estimated blood loss 500-1000ml (AOR, 2.87(95% CI: 1.525-5.396), being positioned supine before spinal anesthesia (AOR = 2.02; 95%CI: (1.243-3.268)) and greater than 1 hr duration of surgery (AOR = 1.97(95%CI: 1.248-3.105) had shown positive association with hypotension.

Conclusion: The prevalence of hypotension was high. Newborn weight, patient position before spinal anesthesia, the duration of surgery, and estimated blood loss are factors associated with hypotension after spinal anesthesia. Decreasing duration of the surgery, controlling bleeding, and optimizing preoperative positioning of the patient are critical aspect to prevent hypotension. By addressing these factors, the prevalence of hypotension after spinal anesthesia can be significantly decreased. In addition, it's our recommendation for longitudinal studies to recognize the long-term effect of spinal induced hypotension.

Keywords: Spinal Anesthesia, spinal anesthesia-induced hypotension, Cesarean section, fluid preloading, preoperative positioning.

1 INTRODUCTION

1.1. Background

Spinal anesthesia (SA) is a technique of introducing anesthetic drugs into the subarachnoid space to temporarily abolish the sensory and motor functions of several groups of spinal nerves (DeLeon and Wong, 2020). It is the preferred technique in cesarean section due to the relative ease of administration and faster onset of action. It involves injection of local anesthetic agents in to the subarachnoid space and surrounding nerves that supply the abdomen and uterus using spinal needle. “This subarachnoid block is mainly administered between L3 and L4, L4 and L5 subarachnoid spaces which supplies at the level of T6 to T10” (Haque et al., 2008, Arias and Lacassie, 2012).

Spinal anesthesia (SA) is the preferred anesthetic technique for cesarean section deliveries, as it provides several benefits over general anesthesia, including immediate bonding between the mother and newborn, a rapid onset of action, and a reduced risk of systemic toxicity and pulmonary aspiration. However, spinal anesthesia is not without its complications, with hypotension being one of the most common and concerning adverse effects. (Algarni et al., 2023, Javed et al., 2011). SA-related complications include hypotension, which is defined as a reduction of blood pressure more than 20% from the baseline of mean arterial blood pressure (Brenck et al., 2009a). It is categorized according to the degree of reduction from the baseline systolic blood pressure. For example, mild hypotension (decrease of ≥10% and ≤20%), moderate hypotension (decrease of >20% and ≤30%), and severe hypotension (decrease of >30%) (Algarni et al., 2023).

Understanding the prevalence and risk factors associated with spinal anesthesia-induced hypotension is crucial for improving the perioperative care of obstetric patients (Šklebar et al., 2019). This knowledge can help anesthesiologists implement effective preventive measures and develop management protocols to minimize the prevalence and adverse consequences of this complication.

1.2. Statement of the Problem

Maternal hypotension is a common complication after spinal anesthesia for cesarean delivery (Shikur et al., 2018). The global prevalence of hypotension after spinal anesthesia for cesarean section has been reported to vary significantly across different studies. Some studies have reported prevalence as low as 1.7% (Karnina et al., 2022), while others have found it to be as high as 74.1% (Šklebar et al., 2019). In Rwanda and Ethiopia reported 40.4% and 64% respectively (Munyanziza, 2022, Shitemaw et al., 2020). This wide range highlights the variability in the prevalence of hypotension depending on the specific population, anesthetic techniques, and other factors (Hartmann et al., 2002).

Hypotension was associated with a higher risk of some pregnancy complications (Bánhidy et al., 2011). Studies on the effect of hypotension occurring during cesarean section on fetal physiology in humans remain scarce; however, research conducted on animals shows that continued reduction in uteroplacental blood flow >60% results in bradycardia and acidemia in a previously non-compromised fetus (Skillman et al., 1985). Neonates born to mothers with spinal anesthesia-induced hypotension were significantly more acidotic (Corke et al., 1982). Hypotension lasting longer than 2 minutes was connected with a significant increase in oxypurines and lipid peroxides in the umbilical vein, which is indicative of an ischemia-reperfusion injury (Okudaira and Suzuki, 2005).

Numerous factors have been identified as being associated with the development of hypotension after spinal anesthesia during cesarean section. These factors can be categorized into patient-related, anesthetic-related, and surgical-related factors. Some of the key patient-related factors include maternal age, body mass index, and baseline blood pressure. Anesthetic-related factors include the dose and type of local anesthetic, speed of administration, and the use of vasopressors. Surgical-related factors such as the duration of the procedure and the position of the patient during the surgery have also been linked to an increased risk of hypotension (Brenck et al., 2009a, Shitemaw et al., 2020, Chumpathong et al., 2006, Chekol et al., 2021).

The duration of hypotension plays a more important role than its severity. A transient pressure drop ≥30% did not affect the Apgar status of the neonate, prevalence of the meconium-stained amniotic fluid or the need for oxygen therapy of the neonate (Maayan-Metzger et al., 2010). Hypotension in the duration shorter than 2 minutes did not affect the neurobehavioral outcome, whereas maternal hypotension lasting longer than 4 minutes can be linked with neurobehavioral changes in the first 4 to 7 days of the neonate's life (Hollmen et al., 1978).

There is limited study examined the prevalence and associated factors of hypotension after spinal anesthesia in different parts of Ethiopia. There is no study done on prevalence and associated factors of hypotension

after spinal anesthesia in the study area. Understanding the overall prevalence of hypotension is crucial for healthcare providers to anticipate and prepare for this potential complication. However, it is essential to assess the prevalence within specific healthcare settings, as factors such as patient demographics, anesthetic practices, and management protocols may differ. This study aims to investigate the prevalence and factors associated with hypotension after spinal anesthesia during cesarean section at Hiwot Fana Specialized University Hospital (HFSCH) and Jagul General Hospital in Harar, Ethiopia.

1.3. Significance of the Study

The primary beneficiary of this study was Hiwot Fana Comprehensive Specialized Hospital. Having a better awareness of the prevalence of spinal anesthesia induced hypotension and associated factors can help health professionals working in public hospitals in Harar town Ethiopia develop strategies to mitigate this risk, thereby enhancing maternal health. These findings will add knowledge or valuable information for Hiwot Fana Comprehensive Specialized Hospital and Jugal General Hospital and Harari regional health bureaus to design a plan on how to improve the existing methods to manage spinal anesthesia induced hypotension. The study serves as an educational resource for medical students, and healthcare professionals. Furthermore, it will be used as an input for future researchers on the related topics.

1.4. Objective

1.4.1. General Objective

- This study aimed to assess the prevalence and factors associated with hypotension after spinal anesthesia during cesarean section at Hiwot Fana Specialized University Hospital and Jugol General Hospital in Harar, Ethiopia, from November 20, 2024- January 20, 2025.

1.4.2. Specific Objectives

- To determine the prevalence of hypotension after spinal anesthesia during cesarean section at Hiwot Fana Specialized University Hospital and Jugol General Hospital in Harar, Ethiopia.
- To identify the factors associated with hypotension after spinal anesthesia during cesarean section at Hiwot Fana Specialized University Hospital and Jugol General Hospital in Harar, Ethiopia.

2. LITERATURE REVIEW

2.1. Prevalence of Hypotension after Spinal Anesthesia during Cesarean Section

A systematic literature search in PubMed was performed from 1999 to 2009 and reported, the prevalence of hypotension varied between 7.4% and 74.1% (KlÖHR et al., 2010). Another systematic review reported that the hypotension rate varied from 29% to 80% based on the definition (Yu et al., 2021). The study conducted in Germany reported hypotension was found in 284 cases (56.5%) (Brenck et al., 2009b).

The cross-sectional study conducted in Indonesia reported prevalence of hypotension based on mean arterial pressure was 1.7% (Karnina et al., 2022). A prospective cohort study conducted in Colombia found 38% of hypotension (Hernández et al., 2018). The retrospective cohort study conducted in Thailand and Taiwan reported 76.7% and 66% respectively (Chumpathong et al., 2006, Li et al., 2024). A prospective study in Nepal reported 46.27% of parturients developed post-spinal hypotension, and 114 (34.03%) reported post-delivery hypotension (Silwal et al., 2024). The cross-sectional study conducted in Bhutan reported the rate of pre-delivery hypotension was 74.6% (Yoezer et al., 2021). In the cross-sectional study conducted in Pakistan 27% had hypotension after surgery (Iqbal et al., 2022).The study conducted in Saudi Arabia reported the prevalence of mild, moderate, and severe hypotension was 31.4%, 23.9%, and 30.1%, respectively (Algarni et al., 2023).

According to the systematic review of the study with 38 studies included reported hypotension rate varied from 29% to 80% based on the definition (Yu et al., 2021). According to the systematic review of the study conducted in resource-limited areas prevalence of hypotension ranged from 15.8% to 91.4% (Zwane et al., 2019). According to a cross-sectional study conducted in the African region, Rwanda (n=44) the prevalence of SA-induced hypotension is 40.4% (Munyanziza, 2022), and Tanzania (n=170) 57 % (Samji et al., 2023). In Ethiopia, few studies were conducted on SA-induced hypotension. According to a cross-sectional study conducted in Addis Ababa Ethiopia reported (n=263) 64% (Shitemaw et al., 2020) and Northwest Ethiopia (n=129) 56.8% (Chekol et al., 2021).

2.2. Factors Associated with Hypotension after Spinal Anesthesia during Cesarean Section

2.2.1. Sociodemographic Factors

Maternal age was stated in studies and had a significant association with post spinal anesthesia hypotension. The study conducted in India reported maternal age group with 18-22 years had 32 patients, 23-27 years

had 22 and 27-30 years had 14 patients and the difference was significant (P< 0.05) (Gupta and Singhal, 2019).

Several studies have reported a significant association of body mass index with hypotension. In a hospital-based cohort study conducted in Saudi Arabia reported BMI significantly associated with hypotension with a p-value of 0.008 (Algarni et al., 2023) and a study conducted in India also reported having body mass index ≥25 significantly associated with hypotension (Gupta and Singhal, 2019). The retrospective cohort study conducted in Thailand reported increased prevalence of hypotension included patient's height < 155 cm (AOR) 1.93, 95%CI 1.19-3.14) (Chumpathong et al., 2006).

2.2.2. Obstetric Medical Factors

A retrospective medical record review conducted in Taiwan reported large multiparous (AOR 1.61 (1.23-2.11) (Li et al., 2024) and a retrospective study conducted in India gravidity ≥ 4 were significantly associated with SA-induced hypotension (Gupta and Singhal, 2019).

Several studies showed that fetal weight and twin pregnancies were significantly associated with SA-induced hypotension. The retrospective medical record review conducted in Taiwan reported large fetal weight (AOR:1.04 CI: (1.01-1.06), and twin pregnancies (AOR:1.381CI: (1.160-1.644) (Li et al., 2024) and cross-sectional studies conducted in Addis Ababa, Ethiopia reported newborn with weight of 2.5–3.9kg (AOR = 3.414; 95% CI: (1.392–8.375) and ≥4kg (AOR, 5.3(95% CI: 1.6–17.7) had shown association with hypotension (Shitemaw et al., 2020)

Several studies reported baseline systolic blood pressure has a significant association with SA-induced hypotension. A report from India showed baseline systolic blood pressure ≤120 mmHg (AOR 2.8, [1.5-5.1] (Yoezer and Tenzin, 2021) and a retrospective medical record review conducted in Taiwan reported baseline SBP (AOR: 0.95 CI: 0.94-0.96) and baseline HR (AOR: 1.02 (1.01-1.03) were significantly associated with SA induced hypotension. Similarly, cross-sectional studies conducted in Addis Ababa, Ethiopia reported baseline systolic blood pressure less than 120mmHg (AOR, 6.293(95% CI: 2.99–13.2) (Shitemaw et al., 2020) and cross-sectional studies from Northern Ethiopia Baseline systolic blood pressure <120 mmhg (AOR, 3.60 95% CI; 1.26–10.31) were significantly associated with hypotension (Chekol et al., 2021).

The study conducted in Bhutan India reported having history of hypertension during pregnancy (AOR 0.25, [0.11-0.60], p=0.013) have significant association with SA induced hypotension (Yoezer and Tenzin, 2021).

2.2.3. Anesthetic and Drug-Related Factors

A Retrospective cohort study conducted in Saudi Arabia reported the dosage of SA, with a p-value of 0.009 significant association with SA-induced hypotension (Algarni et al., 2023). The study conducted in Bhutan India reported prophylaxis use of ephedrine (AOR 0.45, [0.22-0.92] and ondansetron (AOR 0.43, [0.22-0.82], p= 0.010), and sensory block level ≥ T4 (AOR 3.4, [1.8-6.4] (Yoezer and Tenzin, 2021).

The cross-sectional studies conducted in Northern Ethiopia reported absence of spinal additives (AOR, 5.08, 95% CI; 1.78–14.48), duration of crystalloid load before 20 min (AOR, 27.9, 95% CI; 8.3–93.6) and speed of injection < 10 s (AOR, 4.47, 95% CI; 1.14–17.62) were significantly associated with hypotension (Chekol et al., 2021). The cross-sectional studies conducted in Addis Ababa, Ethiopia Sensory block height > T6 (AOR = 2.230; 95%CI: (1.329–3.741) and experience of anesthetist < one year (AOR = 5.033(95% CI: 2.144–11.818) had shown association with hypotension (Shitemaw et al., 2020).

2.2.4. Surgical Related Factors

The volume of blood loss of 500–1000 ml (AOR, 4.16, 95% CI; 1.24–13.94), Patient positioning before SA (AOR, 3.26, 95% CI; 1.04–10.18), and absence of spinal additives (AOR, 5.08, 95% CI; 1.78–14.48) were associated with hypotension (Chekol et al., 2021).

The cross-sectional studies conducted in Addis Ababa, Ethiopia reported the time interval between spinal induction and skin incision > 6 minute (AOR = 1.803; 95% CI: (1.044–3.114)) and experience of anesthetist < one year (AOR = 5.033(95%CI: 2.144–11.818) had shown association with hypotension (Shitemaw et al., 2020). The study conducted in Bhutan India reported longer preoperative fasting duration (AOR 1.12, [1.01-1.21] and sensory block level ≤ T4 (AOR 3.4, [1.8-6.4] (Yoezer and Tenzin, 2021).

2.3. Conceptual Framework

This conceptual framework, developed through a structured literature review, offers a comprehensive overview of factors associated with hypotension following spinal anesthesia during Cesarean sections (Figure 1).

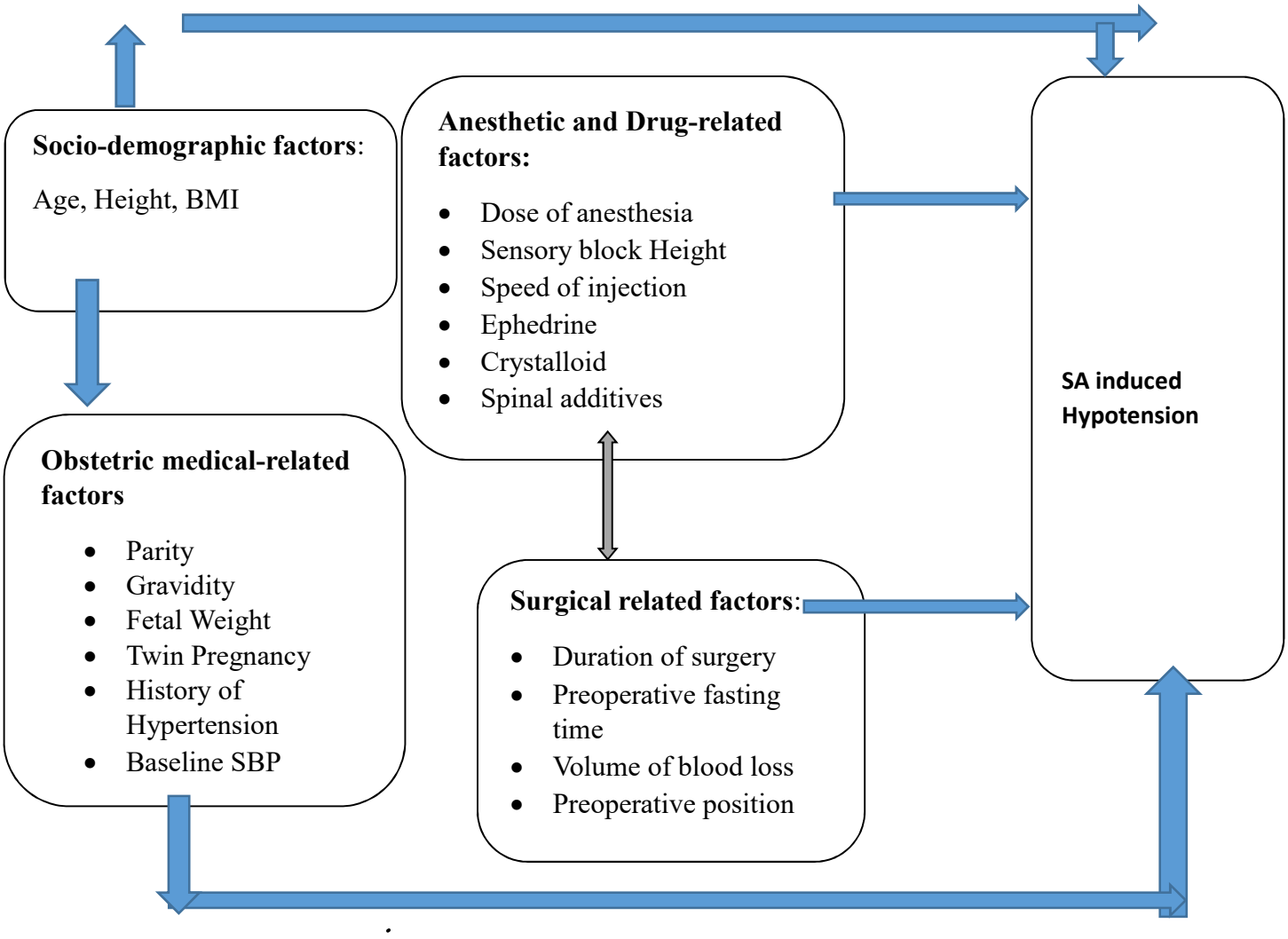

Figure 1: Conceptual framework of factors associated with SA-induced hypotension during cesarean section at Hiwot Fana Specialized University Hospital (HFSCH) and Jugal General Hospital in Harar town, Ethiopia from November 20, 2024 - January 20, 2025 (constructed by investigator from reading of different literature)

3. METHODS

3.1. Study Area and Period

This study was conducted in the public hospitals in the Harari region, eastern Ethiopia. Harari region is one of the 10th regions in Ethiopia which is found in eastern Ethiopia, surrounded by the state of Oromia, and found at a distance of 526 kilometers away from the capital city, Addis Ababa. According to population projection from the 2007 Census, the region has an estimated population of 263,656 in 2020/2021 (CSA, 2012). There are two public hospitals, one private hospital, one police hospital, eight health centers (four urban and four rural), 54 private clinics, and 24 health posts in the region. The study was conducted Hiwot Fana Comprehensive Specialized Hospital (HFCSH) and Jugar General Hospital (JGH). HFCSH provides comprehensive specialized care including for the gynecologic and obstetric and serving as a major referral and academic medical center, serving more than 5 million populations in Eastern Ethiopia. The study was conducted from November 20, 2024 - January 20, 2025.

3.2. Study Design

A facility-based cross-sectional study design was employed.

3.3. Population

3.3.1. Source Population

All women who gave birth by CS with spinal anesthesia at the public hospital in Harar regional state

3.3.2. Study Population

All mothers who gave birth with C/S with SA at selected public hospitals in Harar town during the study period

3.4. Inclusion and Exclusion Criteria

3.4.1. Inclusion Criteria

All patients who are given spinal anesthesia for cesarean section delivery within the study period.

3.4.2. Exclusion Criteria

Participant who received a combination of spinal and general anesthesia.

3.5. Sample Size Determination

For the first objective (outcome), a single population proportion formula is used to calculate the sample size by considering the following statistical assumptions: P = proportion of SA induced hypotension, 64% from the study conducted in Addis Ababa, Ethiopia (Shitemaw et al., 2020).

(Z α/2 = Z score of 95% CI, d= Margin of error (5%).

$n = \frac{(Z\alpha/2)2 \times p(1-p)}{(d)2}$ = $(1.96)^2$*0.64*0.36/ $(0.05)^2$ =354 Then after adding 10 % contingency rate for an incomplete chart, the final sample size is 389

The double population proportion formula is used for the second objective

Table 1: sample size calculation for the factors associated with hypotension after spinal anesthesia during cesarean section at Hiwot Fana Specialized University Hospital (HFSCH) and Jugol General Hospital in Harar, Ethiopia

Factors	Assumptions	Sample size (by adding 10%)	Reference
Sensory height block	CI: 95% Power: 80% Ratio: 1:1 Unexposed: 50.5% Exposed: 77.7% AOR: 2.23	110	(Shitemaw et al., 2020)
Baseline SBP	CI: 95% Power: 80% Ratio: 1: 1 Unexposed: 46.43% Exposed: 62.94% AOR:3.6	308	(Chekol et al., 2021)
Spinal additives	CI: 95% Power: 80% Ratio: 1: 1 Unexposed: 43% Exposed: 65% AOR: 5.07	178	(Chekol et al., 2021)

The largest sample size is found to be 389 from the first objective, therefore it was taken as the final sample size

3.6. Sampling Techniques

According to HMIS report from a hospital, the average number of mother undergoning CS was estimated from the last six months' reports. Then, the total sample 389 is proportionally allocated for both hospitals. The study participants was selected using a simple random sampling technique using lottery method.

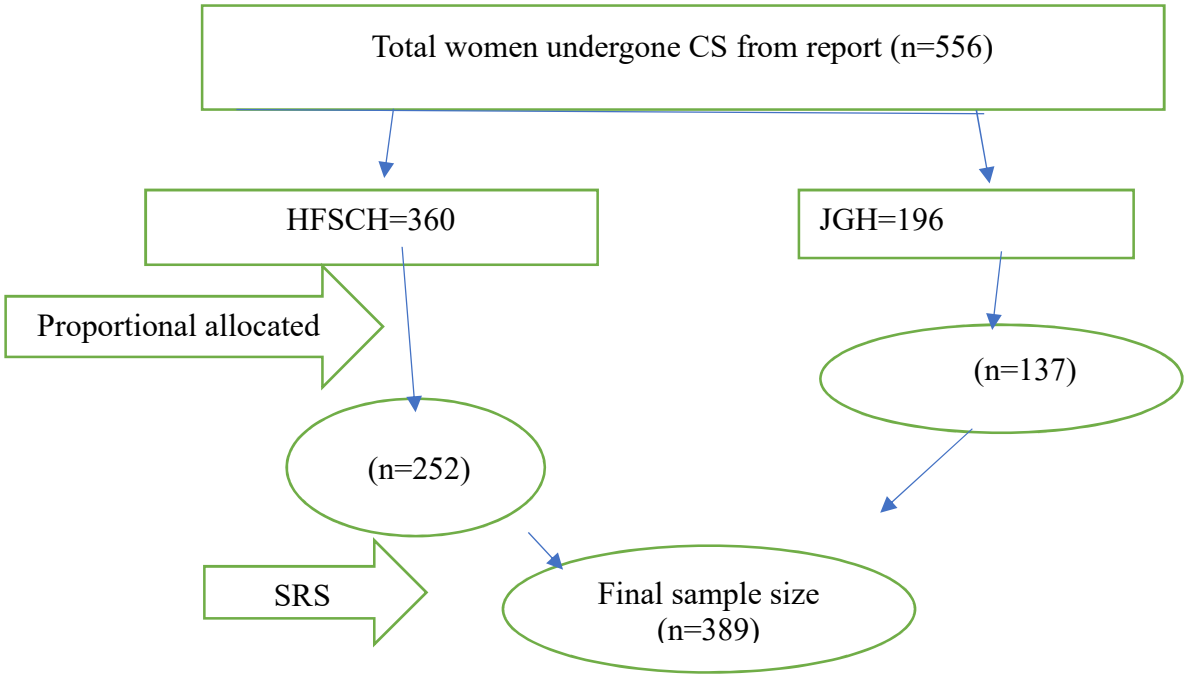

Figure 2: Sampling scheme to assess the prevalence and factors associated with hypotension after spinal anesthesia during cesarean section at HFSCH and Jugal General Hospital in Harar town, Ethiopia 2024/25

3.7. Data Collection Methods

3.7.1. Data Collection Tools

The data was collected from selected study participants using a pretested questionnaire developed from previous literatures (Shitemaw et al., 2020, Chekol et al., 2021, Li et al., 2024). The questionnaire mainly addressed socio-demographic variables (age, BMI, ASA status, and baby weight), maternal variables(gravidity, indication for C/History of hypertension preoperative Hgb and heart rate), anesthetic and surgical variables (LA dose, preload, intraoperative fluids, time interval b/n spinal induction and skin incision, type of surgery (elective and emergency), estimated blood loss, surgeon and anesthetist experience, a dose of uterotonic drug used, any pre and intraoperative drugs used adjuvants used and sensory block height).

3.7.2. Data Collectors

Data were collected by 2 anesthetist and anesthesia and critical care pain medicine resident who have clinical experience was recruited for the supervision of data collectors.

3.7.3. Data Collection Procedures

Data was collected during operation time by the trained data collector other than the anesthesia provider. Body mass index (BMI) of the patient was computed by taking patient's weight and height and was calculated by dividing the weight of the patients in kilogram (kg) by the square height of patients in meter (m^2). Weight was measured in light closing and without shoes by calibrated digital weighing scale. Stadiometer in centimeter in erect position at a precision of 0.1cm without shoes was used to measure height.

3.8. Variables of the Study

3.8.1. Dependent Variable

Prevalence of Spinal anesthesia Induced Hypotension

3.8.2. Independent Variables

Socio-demographic: Maternal age, Height, and BMI

Obstetric medical factors: fetal weight, parity, gravidity, History of HTN, and twin pregnancy

Anesthetic and drug-related factors: LA dose, preload, ephedrine, Crystalloid, Sensory block Height, spinal additives, and Speed of injection

Surgical factors: Duration of surgery, Baseline SBP, volume of blood loss, preoperative patient position before anesthesia and Preoperative fasting time

3.9. Operational Definitions

- **Hypotension** in the studies is systolic blood pressure less than 100 mmHg or > 20% of baseline systolic (KlÖHR et al., 2010)
- **Spinal anesthesia-induced Hypotension**: if systolic blood pressure was less than 100 mmHg or > 20% of baseline systolic blood pressure that developed during the period between spinal anesthesia and childbirth (Yoezer and Tenzin, 2021).
- **Baseline blood pressure**: the mean value of the first three consecutive measurements before commencing SA (Shitemaw et al., 2020)
- **Estimated Blood loss (EBL):** weighing the surgical gauze used to absorb the blood in the surgical field (4 X 4 cm = 10 ml) and adding the volume in the suction bottle (Yoon et al., 2024).
- **Emergency status:** defined as a condition that requires immediate surgical attention due to a risk of death or serious injury with in 6 hours.

3.10. Data Quality Control

Data quality was assured through careful design of data extraction tools and giving training to both the data collectors and supervisors. Pretest was conducted on the questionnaire on 5% of the sample at Jagol General Hospital. During the data collection time, close supervision and monitoring was carried out by supervisors and investigators to ensure the quality of the data. Daily evaluation of the data for completeness and encountered difficulties on the time of data collection was attended accordingly. Finally, all the collected data was checked by the supervisor and investigator for its completeness and consistency during the data management, storage, and analysis.

3.11. Data Processing and Analysis

Before analysis, data were cleaned, edited, and coded. After this data were entered using EpiData 3.1 and analyzed using SPSS version 26. Continuous variables were described using mean and standard deviation. Frequency distribution and percentages were computed for categorical variables. Finally, the outcome of each participant was dichotomized. Variables were recoded and computed through the transform function of the SPSS and then both descriptive statistics and logistic regression analyses was computed. Descriptive statistics was used to summarize tables and figures and statistical summary measures was used for presentation.

Assumption of binary logistic regression model checked. Multicollinearity was checked to see the linear correlation among the associated independent variables by using the Variance Inflation Factor with <5 and tolerance value with >0.1. Binary logistic regressions were carried out to identify significantly associated variables with Spinal anesthesia Induced hypotension. Crude Odds Ratio and Adjusted Odds Ratio (AOR) with 95% CI was computed to determine the associated factor of hypotension, and a P-value less than 0.05 was considered as declared statistically significant. Hosmer and Lemeshow goodness of fit ($P > 0.05$) was used to test the fitness of the model during analysis.

3.12. Ethical Considerations

This study was approved by the Institutional Health Research Ethics Review Committee (IHRERC) of Haramaya University, College of Health and Medical Science (Ref. No. IHRERC/303/2024). A letter of support was written to each public hospital to allow the execution of the research and permission was obtained from the respective hospital administrators. ‘‘Informed, voluntary, written and signed consent” was obtained from the heads of the hospitals and study participants. All the study participants were informed about the purpose, risk, benefit, and confidentiality of the study and their right to refuse, and informed

written and signed voluntary consent was obtained before the interview. The respondents were assured that the information obtained from them will be kept with confidential and do not cause any harm.

3.13. Plan for Dessimination of the Findings

The research will be presented and submitted to Haramaya University, College of Health Sciences, and, critical care and pain medicine. And additionally kept in the Haramaya University, College of Health Science library. Also the findings will be disseminated in to Harar region health bureau and selected health facilities. Moreover, efforts will be done to publish the findings of the study.

4. RESULTS

4.1. Sociodemographic Characteristics of Participants

Out of 389 planned study participants, 388 were included in this study, with a 99.7% response rate. The mean age of the mothers was 27.58 (±4.21SD) years. Two hundred (51.5%) of respondents were from rural areas. Regarding BMI, the majority of them are between 18 and 24.9 kg/m^2 (Table 1).

Table 1: Sociodemographic characteristics of pregnant mothers who undergone C/S under spinal anesthesia at Hiwot Fana Specialized University Hospital (HFSCH) and Jugol General Hospital in Harar, Ethiopia

Variable	Category	Number	Percentage
Age	18-25	147	37.9
	26-34	213	54.9
	≥ 35	28	7.2
Resident	Rural	200	51.5
	Urban	188	48.5
Able to read and write?	Yes	251	64.7
	No	137	35.3
BMI (kg/m^2)	<18	0	0
	18.00-24.9	255	65.7
	25.0-29.90	122	31.4
	≥30	11	2.8
Birth weight of newborn	<2.4kg	42	10.8
	≥2.5kg	346	89.2

4.2. Obstetric and Medical Related Characteristics of Participants

From all study participants, 282 (72.7%) had a preoperative hemoglobin level of above 11mg/dl and the rest were below 11g/dl. The most common indication for cesarean section was malpresentation of fetus 90(23.2%) followed by having Non-reassuring fetal status 87 (22.4%). Most of the study participants 349 (89.9%) had no history of hypertension (Table 3).

Table 2: Obstetric and medical characteristics of pregnant mothers who underwent C/S under spinal anesthesia at a public hospital in Harar, Ethiopia

Variable	Category	Number	Percentage
Gravida	One	74	19.1
	Two	162	41.8
	Three	75	19.3
	Four and above	77	19.8
Gestational age in term	Preterm	48	12.4
	Term	332	85.6
	Post term	8	2.1
Type of gestation	Single	366	94.3
	Twin	22	5.7
Preoperative hemoglobin	< 11mg/dl	106	27.3
	≥ 11mg/dl	282	72.7
Indication for CS	Mal presentation	90	23.2
	Non-reassuring fetal status	87	22.4
	Previous scar	86	22.2
	Previous scar and labour	85	21.9
	Other indication	40	10.3
Types of CS	LUS T C/S	373	96.1
	Midline	15	3.9
History of hypertension	Yes	39	10.1
	No	349	89.9
Patient position before SA	Lateral	119	30.7
	Supine	269	69.3

4.3. Characteristics of Spinal Anesthesia and Drug Used

Majority of the respondents (327(84.3%)) of injection site were between L3 and L4. Injections administered in less than 10 seconds accounted for 17.53% of the cases, while injections administered over 10-15 seconds made up 82.5%. Additionally, the study noted the administration of prophylactic vasoactive drugs with only 3.1% of the participants receiving such medication, whereas 96.9% did not receive any prophylactic vasoactive drugs (Table 3).

Table 3: Characteristics of spinal anesthesia and drug used of pregnant mothers who undergone C/S under spinal anesthesia at Hiwot Fana Specialized University Hospital (HFSCH) and Jugol General Hospital in Harar, Ethiopia.

Variable	Category	Number	Percentage
Site of spinal puncture	L2-L3	32	8.2
	L3-L4	327	84.3
	L4-L5	29	7.5
Spinal needle size	22	63	16.2
	23	284	73.2
	24	36	9.3
	25	5	1.3
Number of attempts	1	321	82.7
	≥2	67	17.3
Speed of injection	<10s	68	17.5
	10-15s	320	82.5
Any prophylactic vasoactive drug given	Yes	12	3.09
	No	376	96.91
Types of uterotonic drugs	Ergotamine	28	7.2
	Oxytocin	360	92.8
Dose of a uterotonic drug	Ergometrine 0.25mg & oxytocin 20IU	37	9.54
	Oxytocin 10IU	21	5.41
	Oxytocin 30IU	330	85.05
Crystalloid preload	Yes	325	83.8
	No	63	16.2
Amount of crystalloid intraoperative	<1000ml	145	37.4
	1000-1500	181	46.6
	>1500	62	16.0

4.4. Surgical Related Characteristics of Study Participants

The estimated blood loss during surgeries was less than 500ml in 305 cases, accounting for 78.61% of the total cases. Regarding surgery duration, 207 procedures (53.35%) were completed in under an hour, whereas 181 procedures (46.65%) took an hour or longer. The interval between anesthesia administration and skin incision was under 5 minutes in 91 cases, representing 23.5 % of the total.

Table 4 Surgical-related factors of pregnant mothers who underwent C/S under spinal anesthesia at a public hospital in Harar, Ethiopia

Variable	Category	Number	Percentage
Estimated blood loss	<500ml	305	78.61
	500-1000ml	83	21.39
Duration f surgery	<1hr	207	53.35
	≥1hr	181	46.65
Time interval between anesthesia and skin incision	<5 minutes	91	23.5
	>6 minutes	297	76.5

4.5. Overall prevalence of Spinal Anesthesia Induced Hypotension among the Study Participants

The overall prevalence of Spinal anesthesia Induced hypotension was 59.28% (95% CI; 54.4-64.20).

4.6. Factors associated with hypotension after spinal anesthesia for cesarean section

Multivariate logistic regressions revealed that newborn weight, preoperative patient position before SA, the duration of surgery, and estimated blood loss were significantly associated with hypotension. Newborn weight, estimated blood loss, being positioned supine before spinal anesthesia and greater than 1 hr duration of surgery had shown association with hypotension.

Mothers with newborn babies with weight of ≥2.5kg were 6.89 times more likely to develop hypotension after spinal anesthesia during cesarean section (AOR = 6.89; 95% CI: (2.986-15.907)) than mothers with newborn babies with weight of <2.5kg. Study participants with estimated blood loss beween 500-1000ml were 2.87 times more likely to develop hypotension after spinal anesthesia during cesarean section than those with <500ml blood loss (AOR, 2.87 (95% CI: 1.525-5.396). In addition, being positioned supine before spinal anesthesia was associated with 2 times high odds of hypotension after spinal anesthesia during cesarean section than being in lateral position (AOR = 2.02; 95%CI: (1.243-3.268)). Moreover, being under surgery for more than 1 hr was associated with 2 times higher odds of hypotension after spinal anesthesia during cesarean section than being under surgery for less than 1 hour (AOR = 1.97(95%CI: 1.248-3.105).

Table 5 Multivariate analysis showing factors associated with hypotension among pregnant mothers who have undergone C/S under spinal anesthesia.

Variable		hypotension		COR (95%, CI)	AOR (95%, CI)	p
		yes	No			
Age	18-25	81	66	1	1	
	26-34	128	85	1.227(0.802,1.877)	1.095(0.660- 1.816)	0.724
	>35	21	7	2.444(0.98-6.104)	2.45(0.851-7.068)	0.097
BMI (kg/m^2)	18-24.9	161	94	1	1	
	25-29.9	63	59	0.623(0.403-0.965	0.650(0.397- 1.065)	0.087
	≥30	6	5	0.701(0.208- 2.358	0.838(0.219- 3.203)	0.796
Time interval between anesthesia induction and skin incision (min)	≤5	48	43	1	1	
	≥6	182	115	1.418(0.883-2.276)	1.40(0.834-2.365)	0.202
Baby birth weight (kg)	<2.5	9	33	1	1	
	≥2.5	221	125	6.483(3.005,13.987)	6.89(2.986-15.907)	**0.000** **
Estimated blood loss (ml)	<500	166	139	1	1	
	500-1000	64	19	2.821(1.612, 4.935)	2.87(1.525-5.396)	**0.001** **
Preop patient positioning before SA	Lateral	60	59	1	1	
	Supine	170	99	1.689(1.091, 2.613	2.016(1.243-3.268)	**0.004** **
Duration of surgery (hr)	<1	103	104	1	1	
	≥1	127	54	2.375(1.562,3.611)	1.968 (1.248-3.105)	**0.04** **
ASA	II	198	145	1	1	
	≥III	32	13	1.803(0.914-3.556)	1.99(0.912-4.339)	0.084
Baseline BP	>=120	136	107	1	1	
	<120	94	51	1.45(0.948-2.217)	1.48(0.934-2.344)	0.095
Baseline HR	<99	134	107	1	1	
	>100	96	51	1.503(0.983,2.297)	1.260 (0.777- 2.043)	0.349
History of hypertension	Yes	27	12	1.618(0.794- 3.3)	0.966 (0. 348, 2. 677)	0.946
	No	203	146	1	1	
Speed of injection (sec)	<10	35	33	0.68(0.402-1.15)	1.011 (0. 530, 1. 931)	0. 973
	10-15	195	125	1	1	

Note: p value < 0.30 for candidate variable, Significant variable at p value <0.05, 1=reference group

5. DISCUSSION

This study was conducted to find out factors related to the prevalence of hypotension in patients who underwent cesarean section with spinal anesthesia at Hiwot Fana Comprehensive Specialized Hospital and Jagul General Hospital, Harar, eastern Ethiopia. This study found out the overall prevalence of hypotension among mothers undergone a cesarean section with spinal anesthesia is almost 6 out of 10 study population. The findings of this study identified Newborn weight, position before anesthesia induction, the duration of surgery, and estimated blood loss as associated factors of spinal ansthesia induced hypotension.

The prevalence of spinal ansthesia induced hypotension in this study is comparable with a study conducted in Northwest Ethiopia (Chekol et al., 2021) and in Ghandi memorial hospital, Addis Ababa, Ethiopia (Shitemaw et al., 2020, Li et al., 2024) and in Tanzania (Samji et al., 2023) . This study finding is lower than the study conducted in South Africa (Zwane et al., 2019). However, higher than a study conducted in Rwanda (Munyanziza, 2022). The possible reason for the different prevalence might be due to different methods of measurement, the operational definition of hypotension, and clinical setup.

Mothers with a newborn weight of ≥2.5kg were almost seven times more at risk of developing hypotension than a newborn weight of <2.5kg weight. Similarly reported with the previous studies finding in which the weight of the newborn was identified as a risk factor for developing hypotension when a newborn's weight is greater than 2.5 kg (Shitemaw et al., 2020, Li et al., 2024). The reason might be as the baby's weight increases, the risk of compression of the inferior vena cava and major arteries by the gravid uterus also rises. This compression can result in a decreased venous return, leading to a reduction in preload and, consequently, predisposing the mother to hypotension (Soma-Pillay et al., 2016).

In this study blood loss of 500-1000 ml was almost three times more likely to develop hypotension when compared with blood loss of <500 ml. This is also reported in the study conducted in Northwest, Ethiopia (Chekol et al., 2021) and Thailand (Somboonviboon et al., 2008). As blood volume decreases, the body attempts to compensate by increasing heart rate and causing peripheral vasoconstriction. However, severe blood loss can overwhelm these compensatory mechanisms, resulting in a drop in systolic blood pressure and the onset of hypotension (Ranjan and Gulati, 2023).

In this study, being positioned supine before spinal anesthesia was two times more likely to develop hypotension when compared with a fully lateral position before spinal anesthesia. Previous studies proved that the prevalence of hypotension was low in the fully left lateral position until the start of surgery (Wang et al., 2015, Chekol et al., 2021). Observational study indicates that the supine position affects clinically relevant cardiovascular measurements in pregnant women (Erango et al., 2018).

In this study, surgeries lasting more than one hour were found to be almost twice as likely to result in hypotension compared to surgeries lasting less than one hour. There is no previous study that shows the association between duration of the surgery and spinal anesthesia induced hypotension. Several factors could explain this correlation. Extended surgeries often involve prolonged anesthesia and greater operative stress, which can lead to increased fluid loss, blood loss, and a higher likelihood of hemodynamic instability. Longer operative times may also necessitate more extensive use of medications that can influence blood pressure, thereby contributing to the higher prevalence of hypotension.

Strength and limitation

5.1. Strength

This study identifies the prevalence and associated factors of hypotension after spinal anesthesia during cesarean sections. We have included both emergency and elective procedures, and the study was conducted at a multiple center.

5.2. Limitation

However, there are some limitations. Some associated variables had wider confidence intervals due to the smaller sample size. Additionally, we did not examine the duration of hypotension, and we considered a single occurrence of hypotension to calculate the overall prevalences

6. CONCLUSION AND RECOMMENDATION

6.1. Conclusion

Almost 6 mothers out of 10 had hypotension after spinal anesthesia during cesarean section which is higher than previous studies in different countries. Newborn weight, position before anesthesia induction, the duration of surgery, and estimated blood loss were significantly associated with hypotension.

6.2. Recommendation

We recommend Clinicians, to recognize these risk factors to manage the occurrence of hypotension. To mitigate the risk of hypotension following spinal anesthesia, it is crucial to consider several key factors. Newborn weight should be closely monitored, as it can influence the onset of hypotension. Decreasing duration of the surgery is also important to reduce risk. Controlling bleeding can help to maintain blood pressure stability. Optimizing preoperative positioning of the patient is another critical aspect to prevent hypotension. By addressing these factors, the prevalence of hypotension after spinal anesthesia can be significantly decreased. In addition, it's our recommendation for longitudinal studies to recognize the long-term effect of spinal induced hypotension.

7. REFERENCES

ALGARNI, R. A., ALBAKRI, H. Y., ALBAKRI, L. A., ALSHARIF, R. M., ALRAJHI, R. K., MAKKI, R. M., et al. 2023. Incidence and Risk Factors of Spinal Anesthesia-Related Complications After an Elective Cesarean Section: A Retrospective Cohort Study. Cureus, 15(1), e34198.

ARIAS, J. & LACASSIE, H. 2012. Prophylaxis and treatment of arterial hypotension during caesarean with spinal anaesthesia. Revista espanola de anestesiologia y reanimacion, 60(9), 511-518.

BÁNHIDY, F., ACS, N., PUHÓ, E. H. & CZEIZEL, A. E. 2011. Hypotension in pregnant women: a population-based case–control study of pregnancy complications and birth outcomes. Hypertension Research, 34(1), 55-61.

BRENCK, F., HARTMANN, B., KATZER, C., OBAID, R., BRÜGGMANN, D., BENSON, M., et al. 2009a. Hypotension after spinal anesthesia for cesarean section: identification of risk factors using an anesthesia information management system. Journal of clinical monitoring and computing, 23, 85-92.

BRENCK, F., HARTMANN, B., KATZER, C., OBAID, R., BRÜGGMANN, D., BENSON, M., et al. 2009b. Hypotension after spinal anesthesia for cesarean section: identification of risk factors using an anesthesia information management system. Journal of Clinical Monitoring and Computing, 23(2), 85-92.

CHEKOL, W. B., MELESSE, D. Y. & MERSHA, A. T. 2021. Incidence and factors associated with hypotension in emergency patients that underwent cesarean section with spinal anaesthesia: Prospective observational study. International Journal of Surgery Open, 35, 100378.

CHUMPATHONG, S., CHINACHOTI, T., VISALYAPUTRA, S. & HIMMUNNGAN, T. 2006. Incidence and risk factors of hypotension during spinal anesthesia for cesarean section at Siriraj Hospital. J Med Assoc Thai, 89(8), 1127-32.

CORKE, B., DATTA, S., OSTHEIMER, G., WEISS, J. & ALPER, M. 1982. Spinal anaesthesia for caesarean section: the influence of hypotension on neonatal outcome. Anaesthesia, 37(6), 658-662.

CSA 2012. Health Survey 2007 Addis Ababa. Ethiopia Central Statistical Agency.

DELEON, A. M. & WONG, C. A. 2020. Spinal anesthesia: Technique. UpToDate, Waltham, MA. https://www. uptod ate. com/cont e nts/spinal-anest hesia-techn ique.

ERANGO, M., FRIGESSI, A. & ROSSELAND, L. A. 2018. A three minutes supine position test reveals higher risk of spinal anesthesia induced hypotension during cesarean delivery. An observational study. F1000Res, 7, 1028.

GUPTA, S. K. & SINGHAL, S. 2019. Determination of Spinal Anesthesia Induced Hypotension in Cesarean Section.

HAQUE, M., SEN, S., MEFTAHUZZAMAN, S. & HAQUE, M. 2008. Anesthesia for emergency cesarean section. Mymensingh Medical Journal: MMJ, 17(2), 221-226.

HARTMANN, B., JUNGER, A., KLASEN, J., BENSON, M., JOST, A., BANZHAF, A., et al. 2002. The incidence and risk factors for hypotension after spinal anesthesia induction: an analysis with automated data collection. Anesth Analg, 94(6), 1521-9, table of contents.

HERNÁNDEZ, M. G. L., FLÓREZ, H. J. M., ROBLES, S. Á. & ARTEAGA, J. D. L. A. 2018. Risk factors for hypotension in regional spinal anesthesia for cesarean section. Role of the Waist-to-Hip Ratio and Body Mass Index. Colombian Journal of Anesthesiology, 46(1), 42-48.

HOLLMEN, A. I., JOUPPILA, R., KOIVISTO, M., MAATTA, L., PIHLAJANIEMI, R., PUUKKA, M., et al. 1978. Neurologic activity of infants following anesthesia for cesarean section. Anesthesiology, 48(5), 350-356.

IQBAL, J., MABOOD, S., ULLAH, S. S., QASIM, R. & AHMAD, A. 2022. Frequency of Post Spinal Hypotension in Elective Cesarean Section after Spinal Anesthesia. Pakistan Journal of Medical & Health Sciences, 16(12), 778-778.

JAVED, S., HAMID, S., AMIN, F. & MAHMOOD, K. T. 2011. Spinal anesthesia induced complications in caesarean section-A review. Journal of Pharmaceutical Sciences and Research, 3(10), 1530.

KARNINA, R., RAHMADANI, S. & FARUK, M. 2022. Incidence of Hypotension, Bradycardia, and Post-operative Nausea and Vomiting with Spinal Anesthesia in Cesarean Section Patient. Open Access Macedonian Journal of Medical Sciences, 10(B), 1602-1606.

KLÖHR, S., ROTH, R., HOFMANN, T., ROSSAINT, R. & HEESEN, M. 2010. Definitions of hypotension after spinal anaesthesia for caesarean section: literature search and application to parturients. Acta Anaesthesiologica Scandinavica, 54(8), 909-921.

LI, Y.-S., LIN, S.-P., HORNG, H.-C., TSAI, S.-W. & CHANG, W.-K. 2024. Risk factors of more severe hypotension after spinal anesthesia for cesarean section. Journal of the Chinese Medical Association, 87(4), 442-447.

MAAYAN-METZGER, A., SCHUSHAN-EISEN, I., TODRIS, L., ETCHIN, A. & KUINT, J. 2010. Maternal hypotension during elective cesarean section and short-term neonatal outcome. American journal of obstetrics and gynecology, 202(1), 56. e1-56. e5.

MUNYANZIZA, T. 2022. Incidence of spinal anesthesia induced severe hypotension among the pregnant women undergoing cesarean section at muhima hospital. Rwanda Journal of Medicine and Health Sciences, 5(1), 62-70.

OKUDAIRA, S. & SUZUKI, S. 2005. Influence of spinal hypotension on fetal oxidative status during elective cesarean section in uncomplicated pregnancies. Archives of Gynecology and Obstetrics, 271, 292-295.

RANJAN, A. K. & GULATI, A. 2023. Controls of Central and Peripheral Blood Pressure and Hemorrhagic/Hypovolemic Shock. Journal of Clinical Medicine, 12(3), 1108.

SAMJI, S., KYEJO, W. & LUGAZIA, E. 2023. Prevalence and Risk Factors of Hypotension in Patients Undergoing Cesarean Section with Spinal Anesthesia at Muhimbili National Hospital.

SHIKUR, B., MARYE, A. & MESFIN, E. 2018. Spinal anesthesia for cesarean delivery at two teaching hospitals in Addis Ababa, Ethiopia. Ethiop. med. j.(Online), 133-140.

SHITEMAW, T., JEMAL, B., MAMO, T. & AKALU, L. 2020. Incidence and associated factors for hypotension after spinal anesthesia during cesarean section at Gandhi Memorial Hospital Addis Ababa, Ethiopia. PLoS One, 15(8), e0236755.

SILWAL, S., SUBEDI, A., BHATTARAI, B. & GHIMIRE, A. 2024. Association between preoperative shock index and hypotension after spinal anesthesia for non-elective cesarean section: a prospective cohort study. BMC Anesthesiology, 24(1), 383.

SKILLMAN, C. A., PLESSINGER, M. A., WOODS, J. R. & CLARK, K. E. 1985. Effect of graded reductions in uteroplacental blood flow on the fetal lamb. American Journal of Physiology-Heart and Circulatory Physiology, 249(6), H1098-H1105.

ŠKLEBAR, I., BUJAS, T. & HABEK, D. 2019. SPINAL ANAESTHESIA-INDUCED HYPOTENSION IN OBSTETRICS: PREVENTION AND THERAPY. Acta Clin Croat, 58(Suppl 1), 90-95.

SOMA-PILLAY, P., NELSON-PIERCY, C., TOLPPANEN, H. & MEBAZAA, A. 2016. Physiological changes in pregnancy. Cardiovasc J Afr, 27(2), 89-94.

SOMBOONVIBOON, W., KYOKONG, O., CHARULUXANANAN, S. & NARASETHAKAMOL, A. 2008. Incidence and risk factors of hypotension and bradycardia after spinal anesthesia for cesarean section. J Med Assoc Thai, 91(2), 181-7.

WANG, X., XU, J.-M., ZHOU, F., HE, L., CUI, Y.-L. & LI, Z.-J. 2015. Maternal position and development of hypotension in patients undergoing cesarean section under combined spinal-epidural anesthesia of intrathecal hyperbaric ropivacaine. Medical science monitor: international medical journal of experimental and clinical research, 21, 52.

YOEZER, T. & TENZIN, K. 2021. Pre-Delivery Hypotension. Bhutan Health Journal, 7, 16-23.

YOEZER, T., TENZIN, K., TSHERING, J., THAN, Y. M. & WANGMO, K. P. 2021. Pre-delivery hypotension after spinal anesthesia during cesarean section and its associated factors at Jigme Dorji Wangchuck National Referral Hospital, Bhutan. Bhutan Health Journal, 7(1), 16-23.

YOON, D., YOO, M., KIM, B. S., KIM, Y. G., LEE, J. H., LEE, E., et al. 2024. Automated deep learning model for estimating intraoperative blood loss using gauze images. Scientific Reports, 14(1), 2597.

YU, C., GU, J., LIAO, Z. & FENG, S. 2021. Prediction of spinal anesthesia-induced hypotension during elective cesarean section: a systematic review of prospective observational studies. International Journal of Obstetric Anesthesia, 47, 103175.

ZWANE, S. F., BISHOP, D. G. & RODSETH, R. N. 2019. Hypotension during spinal anaesthesia for Caesarean section in a resourcelimited setting: Towards a consensus definition. Southern African Journal of Anaesthesia and Analgesia, 25(1).

8. Annexes

8.1. Information Sheet and Informed Voluntary Consent Form for Head of Public Hospital

1. Introduction

My name is **Dr. Mengistu Chalie.** I am working as a principal investigator of the study being conducted in this institution. I'm studying for my Anesthesiology, critical care and pain medicine Specialty at Haramaya University, the College of Health and Medical Sciences. I kindly request you to lend me your attention to explain you about the study and your institution being selected as the study setting.

2. The study title: The prevalence and factors associated with hypotension after spinal anesthesia during cesarean section at HFSCH in Harar, Ethiopia 2024.

3. Purpose/aim of the study: This study will quantify and provide up-to-date information about the prevalence and factors associated with hypotension after spinal anesthesia during cesarean section for the public hospitals, which are important to know areas of interventions that help to improve the health of mothers. This study also will generate a piece of evidence for the hospital to develop preventive and educational programs according to the national health policy based on the study finding to achieve a reduction of mortality and morbidity among mothers. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of specialization degree in anesthesiology, critical care and pain medicine for the principal investigator.

4. Procedure and duration: To achieve the above objective, information that is necessary for the study will be taken during operation time in the operation room.

5. Risks and benefits: Since the study will be conducted by taking appropriate information from the medical chart, it will not inflict any harm on the patients. The research has no direct benefit for one whose document/ record is included in this research. But the indirect benefit of the research for the participant and other clients in the program is clear. This is because if program planners are preparing predicted plans there is a benefit for clients in the program of getting appropriate care and treatment services for those survived and other newly born ones. In all, the research work has a paramount direct benefit for health care planners and managers.

6. Confidentiality: The information that we will be provided will be kept confidential. There will be no information that will identify the participants in particular. The findings of the study will be general for the study population and will not reflect anything particular about individual persons. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research. Confidential information about the identity of individual patients from charts

(individual participant identification number, name, facility registry code, and hospital arrival date) will be kept secret by the data collector in the separate logbook, which is used only to complete forms in case of doubts or missing data.

7. Rights: Participation in this study is fully voluntary. The participants have the right to declare to participate or not in this study. If they decide to participate, they have the right to withdraw from the study at any time and this will not label them for any loss of benefits to which they otherwise are entitled. They do not have to answer any question that they do not want to answer. The hospital also has the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the data collection process in the hospital.

8. Contact address: If there are any questions or enquires any time about the study or the procedures, please contact Principal Investigator: **Mengistu Chalie**, Email-mengistuchalie8@gmail.com, at mobile phone: +251928448032 as well as Institutional Health Research Ethics Review Committee (IHRERC) of Haramaya University College of Health and Medical Sciences at office phone 0254662011 or P.O. Box 235, Harar, Ethiopia.

9. Declaration of informed voluntary consent: I have read the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating, and the contact address for any queries. I have been allowed to ask questions about things that may have been unclear. I was informed that participants have the right to withdraw from the study at any time or not to answer any question that they do not want. I am also informed that the Hospital has the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the data collection process on the Hospital's premises.

Therefore, I declare my voluntary consent on behalf of _____ management to allow this study to be conducted in the Hospital with my initials (signature).

Name and Signature of Head of the Hospital: _____ Date _____

Name and Signature of principal investigator: _____ Date _____

8.2. Participant Information Sheet and Informed Voluntary Consent Form For Minors (Age < 18 Years) /Vulnerable Individuals to Be Signed By Their Legal Competent Adult Representative

1. Introduction:

My name is_____. I am working as a data collector for a study conducted by **Dr. Mengistu Chalie**, who is studying for Anesthesiology, critical care, and pain medicine Specialty at Haramaya University, the College of Health and Medical Sciences. I kindly request you to lend me your attention to explain you about the study and study participant.

2. The study/project title:

The prevalence and factors associated with hypotension after spinal anesthesia during cesarean section at HFSCH in Harar, Ethiopia 2024.

3. Purpose/aim of the study:

This study will quantify and provide up-to-date information about the prevalence and factors associated with hypotension after spinal anesthesia during cesarean section for the public hospitals, which are important to know areas of interventions that help to improve the health of mothers. This study also will generate a piece of evidence for the hospital to develop preventive and educational programs according to the national health policy based on the study finding to achieve a reduction of mortality and morbidity among mothers. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of specialization degree in anesthesiology, critical care, and pain medicine for the principal investigator.

4. Procedure and duration: I will interview your child using a questionnaire to provide me with pertinent data that is helpful for the study. There are 41 questions and the interview will take about 30 minutes, so I kindly request you to spare me this time for the interview.

5. Risks and benefits: The risk of being participating for your child in this study is very minimal; but only taking few minutes from your time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for the local health planners.

6. Confidentiality: The information that we will collect from this study will be confidential. There will be no information that will identify your child or yourself in particular. The findings of the study will be general for the study community and will not reflect anything particular of individual persons or housing. The data that we gather from the measurements will exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

7. Rights: Participation for this study is fully voluntary. You have the right to declare to allow your child to be involved in this study or not. If you would allow your child for this study, you have the right to withdraw

him/her from the study at any time and this will not label you/your child for any loss of benefits which you/your child otherwise are entitled. You do not have to answer any question that you do not as well.

8. Contact address: If there are any questions or enquires any time about the study or the procedures, please contact: **Mengistu Chalie**, by Email-mengistuchalie8@gmail.com**,** at mobile phone: +251928448032; as well as contact address of the responsible Institutional Health Research Ethics Review Committee (IHRERC) at office phone +251254662011 or P.O.Box 235, Harar, Ethiopia].

9. Declaration of informed voluntary consent:

I have read/ was read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that I have the right to withdraw my child from the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent to allow my child to participate (be involved) in this study with my initials (signature).

Name of the participant: _____ (Assent affirmed if a minor age of 12-17 years)

Name and signature of parent/legal guardian: _____ _____ Date: _____

Name and signature of Data Collector: _____ Date: _____

8.3. Participant Information Sheet and Informed Voluntary Consent Form (For Competent Adults: Ages ≥18 Years)

1. Introduction

My name is_____. I am working as a data collector for a study conducted by **Dr. Mengistu Chalie**, who is studying for Anesthesiology, critical care, and pain medicine Specialty at Haramaya University, the College of Health and Medical Sciences. I kindly request you to lend me your attention to explain you about the study and study participant.

2. The study/project title: The prevalence and factors associated with hypotension after spinal anesthesia during cesarean section at HFSCH in Harar, Ethiopia 2024.

3. Purpose/aim of the study: This study will quantify and provide up-to-date information about the prevalence and factors associated with hypotension after spinal anesthesia during cesarean section for the public hospitals, which are important to know areas of interventions that help to improve the health of mothers. This study also will generate a piece of evidence for the hospital to develop preventive and educational programs according to the national health policy based on the study finding to achieve a reduction of mortality and morbidity among mothers. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of specialization degree in anesthesiology, critical care, and pain medicine for the principal investigator.

4. Procedure and duration: I will be interviewing you using a questionnaire to provide me with pertinent data that is helpful for the study. There are 41 questions to answer where I will fill the questionnaire by interviewing you. The interview will take about 30 minutes, so I kindly request you to spare me this time for the interview.

5. Risks and benefits: The risk of being participating in this study is very minimal, but only taking few minutes from your time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for the local health planners.

6. Confidentiality: The information you will provide us will be confidential. There will be no information that will identify you in particular. The findings of the study will be general for the study community and will not reflect anything particular of individual persons or housing. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

7. Rights: Participation for this study is fully voluntary. You have the right to declare to participate or not in this study. If you decide to participate, you have the right to withdraw from the study at any time and this

will not label you for any loss of benefits which you otherwise are entitled. You do not have to answer any question that you do not want to answer.

8. Contact address: If there are any questions or enquires any time about the study or the procedures, please contact: **Mengistu Chalie**, by **Email- mengistuchalie8@gmail.com,** at mobile phone: +251928448032; as well as contact address of the responsible Institutional Health Research Ethics Review Committee (IHRERC) at office phone 0254662011 or P.O.Box 235, Harar, Ethiopia].

9. Declaration of informed voluntary consent:

I have read/ was read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that I have the right to withdraw from the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent to participate in this study with my initials (signature).

Name and signature of participant: _____ Date _____

Name and signature of Data Collector: _____ Date _____

8.4. Amharic Version of Participant Information Sheet and Informed Voluntary Consent Form for Minors (Age < 18 Years) /Vulnerable Individuals to Be Signed By Their Legal Competent Adult Representative

1. መግቢያ

ስሜ._____ይባላል፡፡ በሀሮማያ ዩኒቨርሲቲ ጤና እና ህክምና ሳይንስ ኮሌጅ

በሰመመን እና ፅኑ ህሙማን እንክብካቤ ህክምና ትምህርት ክፍል የድህረ ምረቃ ተማሪ በሆኑት ዶ/ር መንግስቱ ቻሌ ለሚያካሂደው ጥናት መረጃ ሰብሳቢ ሁኝ እየሰራሁ ነው፡፡ ስለጥናቱ እና የጥናቱ ተሳታፊ ለዕርስዎ ለማስረዳት ትኩረት እንዲሰጠኝ ስል በትህትና እጠይቃለሁ፡

2. የጥናቱ ርዕስ፡

በህይወት ፋና ሁሉን አቀፍ ስፔሻላይዝድ ሆስፒታል ውስጥ በቀዶ ጥገና ከሚዎልዱት እናቶች

መካከል ከድህረ ስፓይናል ማደነዘዣ በኋላ ስለሚከሰት የደም ግፊት መቀነስ እና የሚያጋልጡ ሁኔታዎችን መለየት።

3. የጥናቱ አላማ፡

የዚህ ጥናት ዋና አላማ በህይወት ፋና ሁሉን አቀፍ ስፔሻላይዝድ ሆስፒታል ውስጥ ካሉ በቀዶ ጥገና ከሚዎልዱት እናቶች መካከል ከድህረ ስፓይናል ማደነዘዣ በኋላ ስለሚከሰት የደም ግፊት መቀነስ እና የሚያጋልጡ ሁኔታዎችን መለየት። በተጨማሪም የጥናቱ ውጤት በጤና ተቋማት የሚሰጠውን የጤና

አገልግሎት ለማሻሻ እና በእናቶች ላይ ሚከሰተውን ሞት እና ህመም ለመቀነስ ይረዳል፡፡ በዋንኛነት ለመመረቂያ የሚሆን ጥናታዊ ፅሁፍ በከፊል ለማሟላት ነው፡፡

4. የጥናቱ ሂደት እና ቆይታ፡

ለጥናቱ የሚረዳ ጠቃሚ መረጃ እንዲሰጠኝ መጠይቅ በማድረግ ጠቅላላ ጥያቄዎች ለልጅዎ ቃለመጠይቅ አደርጋለሁ ፡፡ እንዲሁም መጠይቁ 41 ጥያቄዎችን የያዘ ሲሆን የመጠይቁ መረጃ አሞላል ማደንዘዣ ከተሰጠ በኋላም የሚቀጥል እና ለ30 ደቂቃ ያህል የሚፈጅ ይሆናል፡፡

5. ጥቅም እና ጉዳት፡

በዚህ ጥናት ውስጥ ለሚሳተፉት ምንም አይነት ጉዳት የለውም፡፡ ነገር ግን ከተሳታፊወች ጊዜ ጥቂት ደቂቃዎች ይወስዳል፡፡ በዚህ ጥናት ውስጥ ለግምገማ ምንም አይነት ቀጥተኛ ክፍያ አይኖርም፡፡

ነገር ግን ከዚህ ምርምር የተገኙት ግኝቶች ለማህበረሰቡ እና ለአካባቢው የጤና እንክብካቤ እቅድ አውጪወች ጠቃሚ መረጃን ያሳያሉ፡፡

6. ሚስጥራዊነት፡ የምናቀርበው መረጃ በሚሰጥር የሚጠበቅ ይሆናል። በተለይ ተሳታፊውን የሚለይ መረጃ አይኖርም። የጥናቱ ግኝቶች ለጥናት ማህበረሰብ አጠቃላይ ይሆናል እናም የግለሰብን ሰው ምንም የሚያንፀባርቅ አይሆንም። ጠያቂው ስሞችን ከማሳየት እንዲገለሉ ኮድ ይደረጋል። ተሳታፊውን ከምርምር ጋረ ሊያገናኝ የሚችል የቃል ወይም የፁሁፍ ዘገባወች ምንም ማጣቃሻ የለም።

7. መብቶች፡ የዚህ ጥናት ተሳትፎ ሙሉ በሙሉ በፍቃደኝነት ነው። ተሳታፊዎች በዚህ ጥናት ውስጥ ለመሳተፍ ወይም ላለመሳተፍ የመግለፅ መብት አላቸው። ለመሳተፍ ከወሰኑ በማንኛውም ጊዜ በጥናቱ የመውጣት መብት አላቸው እና ይህ ካልሆነ ግን መብት ላላቸው ጥቅማጥቅሞች ኪሳራ አይገልፁም ሊመልሱት የማይፈልጉትን ጥያቄ መመለስ አያስፈልጋቸውም።

8. አድራሻ፡ ስለ ጥናቱ ወይም አካሄዶቹ ማናቸውም ጥያቄዎች ካለ እባክዎ በዚህ አድራሻ ያግኙ። የጥናቱ መሪ ዶ/ር መንግስቱ ቻሌ ፡ ኢሜይል፡ Email-mengistuchalie8@gmail.com, ሞባይል ስልክ +251928448032 እንዲሁም ተቋማዊ የጤና ጥናት እና ምርምር ስነምግባር ግምገማ ኮሚቴ፡ ስልክ፡ +251254662011 ወይም ፖ.ሣ.ቁ. 235፡ ሐረር፣ ኢትዮጵያ።

9. በመረጃ ላይ የተመሰረተ የፍቃደኝነት ስምምነት መግለጫ

ይህን ቅፅ አንብቤዋለሁ ወይም በምረዳው ቋንቋ ተነቦልኛል:: የጥናቱ አላማውን፣ አካሄዶቹን፣ ስጋቶቹን እና ጥቅሞቹን፣ ሚስጥራዊነት ጉዳዮቹን፣ የመሳተፍ መብቶችን እና ለማንኛውም መጠይቆች አድራሻውን በግልፅ ተረድቻለሁ። ግልፅ ባልሆኑ ጉዳዮች ላይ ጥያቄወችን እንድጠይቅ እድል ተሰጥቶኛል። በማንኛውም ጊዜ ከጥናቱ የመውጣት ወይም የማልፈልገውን ማንኛውንም ጥያቄ ላለመመለስ መብት እንዳለኝ ተነግሮኛል። ሰለዚህ ከዚህ በታች በተገለፀው መሰረት በዚህ ጥናት ለመሳተፍ በፍቃደኝነት መስማማቴን በፊርማዬ አረጋግጣለሁ።

የጥናቱ ተሳታፊ ስም:_____ (እድሜ 12-17 አመት፤ ጥናቱ እንዲደረግ መስማማቴን አረጋግጫለሁ።)

የወላጅ /አሳዳጊ ስም እና ፊርማ _____ቀን_____.

የመረጃ ሰብሳቢው ስም እና ፊርማ_____ቀን_____.

8.5. Afan Oromo Version of Participant Information Sheet and Informed Voluntary Consent Form for Minors (Age < 18 Years) /Vulnerable Individuals to Be Signed By Their Legal Competent Adult Representative

1. Seensa

Maqaan koo Dr. Mengistuu Chaaliyee jedhama. Qorannoon dhaabbata kana keessatti gaggeeffamaa jiru qorataa ijoo ta'ee hojjechaa jira. Ani Yunivarsiitii Haramaya, Kolleejjii Saayinsii Fayyaa fi Meedikaalaa keessatti Ispeeshaalitii Anesthesiology, critical care, fi pain medicine barachaa jira. Waa'ee qo'annichaa fi dhaabbati keessan akka bakka qo'annootti filatamuu isaa akka isiniif ibsuuf xiyyeeffannoo keessan akka naaf liqeessitan kabajaan isin gaafadha.

2. Mata duree qo'annichaa/pirojektichaa:

Tatamsa'inaafi sababoota dhiibbaa dhiigaa gadi bu'uu waliin walqabatan erga lafee dugdaatti anesthesia booda yeroo baqaqsanii hodhuu HFSCH Harar, Ethiopia 2024.

3. Kaayyoo/kaayyoo qorannichaa:

Qorannoon kun hospitaalota mootummaaf yeroo baqaqsanii hodhuu booda babal'ina fi sababoota dhiibbaa dhiigaa gadi bu'uu wajjin walqabatan safaraa fi odeeffannoo wayitaawaa kan kennu yoo ta'u, kunis naannoowwan gidduu-galummaa fayyaa haadholii fooyyessuuf gargaaran beekuun barbaachisaa dha. Qorannoon Kun akkasumas hospitaalichi akkaataa imaammata fayyaa biyyaalessaatiin sagantaa ittisaa fi barnootaa akka qopheessu argannoo qorannichaa irratti hundaa'uun du'aatii fi dhukkubbii haadholii hir'isuu galmaan ga'uuf ragaa ni maddisiisa. Kana malees, kaayyoon qorannoo kanaa qorataa muummichaaf digrii ispeeshaalaayizeeshinii anesthesiology, critical care, fi pain medicine guutuuf akka barbaachisummaa gartokkeetti barruu qorannoo barreessuudha.

4. Adeemsaa fi yeroo:

Daataa barbaachisaa ta'ee fi qorannichaaf gargaaru naaf kennuudhaaf gaaffilee fayyadamee isin gaafadha. Gaaffiiwwan 41 deebisuuf jiran eessatti gaaffii fi deebii isiniin godheen guuta. Gaaffii fi deebii gara daqiiqaa 30 waan fudhatuuf yeroo kana gaaffii fi deebii kanaaf akka na qusattan kabajaan isin gaafadha.

5. Balaa fi faayidaa:

Balaan qorannoo kana irratti hirmaachuu baayyee xiqqaadha, garuu yeroo keessan irraa daqiiqaa muraasa qofa fudhachuudha. Qorannoon kana irratti hirmaachuuf kaffaltiin kallattiin hin jiraatu ture. Garuu argannoon qorannoo kanarraa argamu karoorsitoota fayyaa naannoo sanaaf odeeffannoo barbaachisaa ta'e mul'isuu danda'a.

6. Iccitii:

Odeeffannoon isin nuuf kennitan iccitii ta'a. Odeeffannoon addatti si adda baasu hin jiraatu. Argannoon qorannichaa hawaasa qorannichaaf waliigalaa kan ta’u yoo ta’u, namoota dhuunfaa ykn mana jireenyaa adda ta’e kan hin calaqqisiifne ta’a. Gaaffiin maqaa agarsiisu akka hin dabalamneef koodii ni kennama. Gabaasa afaaniin ykn barreeffamaan hirmaattoota qorannicha waliin walqabsiisuu danda’u keessatti eeruun hin kennamu.

7. Mirgoota:

Qorannoon kanaaf hirmaannaan guutummaatti fedhii ofiitiin kan raawwatamudha. Qo’annoo kana irratti hirmaachuu fi dhiisuu kee labsuuf mirga qabda. Yoo hirmaachuuf murteessite yeroo barbaaddetti qo’annoo irraa ba’uuf mirga qabda kunis faayidaa kasaaraa karaa biraatiin siif malu kamiyyuu si hin mallatu. Gaaffii deebii kennuu hin barbaanne kamiyyuu deebisuun si hin barbaachisu.

8. Teessoo quunnamtii: Waa’ee qorannichaa ykn hojimaata yeroo kamiyyuu gaaffiin ykn gaaffii yoo jiraate, maaloo qunnamaa: Mengistu Chalie, karaa Email-mengistuchalie8@gmail.com, bilbila harkaa: +251928448032; akkasumas teessoo quunnamtii itti gaafatamummaa qabu koree gamaaggama naamusa qorannoo fayyaa dhaabbilee (IHRERC) bilbila waajjira 0254662011 ykn P.O.Box 235, Harar, Ethiopia].

9. Ibsa hayyama tola ooltummaa beekumsa qabu:

Waraqaa odeeffannoo hirmaattotaa dubbiseera/ naaf dubbifameera. Kaayyoo qorannichaa, hojimaata, balaa fi faayidaa, dhimmoota iccitii, mirga hirmaachuu fi teessoo quunnamtii gaaffii kamiifuu sirriitti hubadheera. Wantoota ifa hin taane ta’uu danda’aniif gaaffii akkan gaafadhu carraan naaf kennameera. Yeroo barbaadetti qo’annoo keessaa ba’uuf ykn gaaffii ani hin barbaanne kamiyyuu deebisuuf mirga akkan qabu naaf himameera. Kanaafuu, qorannoo kana irratti hirmaachuuf fedhii kootiin hayyama koo qubee jalqabaa (mallattoo) kootiin nan ibsa.

Maqaa hirmaataa: _____ (Hayyama mirkanaa’e yoo umuriin isaa xiqqaa waggaa 12-17 ta’e)

Maqaa fi mallattoo maatii : _____ Guyyaa _____.

Maqaa fi mallattoo Walitti qabaa Odeeffannoo: _____ Guyyaa _____.

8.6. Amharic Version of Participant Information Sheet And Informed Voluntary Consent Form (For Competent Adults: Ages ≥18 Years)

1. መግቢያ

ስሜ._____ይባላል፡፡ በሀሮማያ ዩኒቨርሲቲ ጤና እና ህክምና ሳይንስ ኮሌጅ

በሰመመን እና ፅኑ ህሙማን እንክብካቤ ህክምና ትምህርት ክፍል የድህረ ምረቃ ተማሪ በሆኑት ዶ/ር መንግስቱ ቻሌ ለሚያካሂደው ጥናት መረጃ ሰብሳቢ ሁኝ እየሰራሁ ነው፡፡ ስለጥናቱ እና የጥናቱ ተሳታፊ ለዕርስዎ ለማስረዳት ትኩረት እንዲሰጠኝ ስል በትህትና እጠይቃለሁ፡

2. የጥናቱ ርዕስ፡

በህይወት ፋና ሁሉን አቀፍ ስፔሻላይዝድ ሆስፒታል ውስጥ በቀዶ ጥገና ከሚዎልዱት እናቶች

መካከል ከድህረ ስፓይናል ማደነዘዣ በኋላ ስለሚከሰት የደም ግፊት መቀነስ እና የሚያጋልጡ ሁኔታዎችን መለየት።

3. የጥናቱ አላማ፡

የዚህ ጥናት ዋና አላማ በህይወት ፋና ሁሉን አቀፍ ስፔሻላይዝድ ሆስፒታል ውስጥ ካሉ በቀዶ ጥገና ከሚዎልዱት እናቶች መካከል ከድህረ ስፓይናል ማደነዘዣ በኋላ ስለሚከሰት የደም ግፊት መቀነስ እና የሚያጋልጡ ሁኔታዎችን መለየት። በተጨማሪም የጥናቱ ውጤት በጤና ተቋማት የሚሰጠውን የጤና

አገልግሎት ለማሻሻ እና በእናቶች ላይ ሚከሰተውን ሞት እና ህመም ለመቀነስ ይረዳል፡፡ በዋንኛነት ለመመረቂያ የሚሆን ጥናታዊ ፅሁፍ በከፊል ለማሟላት ነው፡፡

4. የጥናቱ ሂደት እና ቆይታ፡

ለጥናቱ የሚረዳ ጠቃሚ መረጃ እንዲሰጠኝ መጠይቅ በመጠቀም ቃለመጠይቅ አደርጋለሁ፡፡ እንዲሁም መጠይቁ 41 ጥያቄዎችን የያዘ ሲሆን የመጠይቁ መረጃ አሞላል ማደንዘዣ ከተሰጠ በኋላም የሚቀጥል እና ለ30 ደቂቃ ያህል የሚፈጅ ይሆናል፡፡

5. ጥቅም እና ጉዳት፡

በዚህ ጥናት ውስጥ ለሚሳተፉት ምንም አይነት ጉዳት የለውም፡፡ ነገር ግን ከተሳታፊወች ጊዜ ጥቂት ደቂቃዎች ይወስዳል፡፡ በዚህ ጥናት ውስጥ ለግምገማ ምንም አይነት ቀጥተኛ ክፍያ አይኖርም፡፡

ነገር ግን ከዚህ ምርምር የተገኙት ግኝቶች ለማህበረሰቡ እና ለአካባቢው የጤና እንክብካቤ እቅድ አውጪወች ጠቃሚ መረጃን ያሳያሉ፡፡

6. ሚስጥራዊነት፡

የምናቀርበው መረጃ በሚሰጥር የሚጠበቅ ይሆናል። በተለይ ተሳታፊውን የሚለይ መረጃ አይኖርም። የጥናቱ ግኝቶች ለጥናት ማህበረሰብ አጠቃላይ ይሆናል እናም የግለሰብን ሰው ምንም የሚያንፀባርቅ አይሆንም። ጠያቂው ስሞችን ከማሳየት እንዲገለሉ ኮድ ይደረጋል። ተሳታፊውን ከምርምር ጋረ ሊያገናኝ የሚችል የቃል ወይም የፁሁፍ ዘገባወች ምንም ማጣቃሻ የለም።

7. መብቶች፡

የዚህ ጥናት ተሳትፎ ሙሉ በሙሉ በፍቃደኝነት ነው። ተሳታፊዎች በዚህ ጥናት ውስጥ ለመሳተፍ ወይም ላለመሳተፍ የመግለፅ መብት አላቸው። ለመሳተፍ ከወሰኑ በማንኛውም ጊዜ በጥናቱ የመውጣት መብት አላቸው እና ይህ ካልሆነ ግን መብት ላላቸው ጥቅማጥቅሞች ኪሳራ አይገልፁም ሊመልሱት የማይፈልጉትን ጥያቄ መመለስ አያስፈልጋቸውም።

8. አድራሻ፡

ስለ ጥናቱ ወይም አካሄዶቹ ማናቸውም ጥያቄዎች ካለ እባክዎ በዚህ አድራሻ ያግኙ። የጥናቱ መሪ ዶ/ር መንግስቱ ቻሌ ፡ ኢሜይል፡ **Email-mengistuchalie8@gmail.com,** ሞባይል ስልክ +251928448032 እንዲሁም ተቋማዊ የጤና ጥናት እና ምርምር ስነምግባር ግምገማ ኮሚቴ፡ ስልክ፡ +251254662011 ወይም ፖ.ሣ.ቁ. 235፡ ሐረር፣ ኢትዮጵያ።

9. በመረጃ ላይ የተመሰረተ የፍቃደኝነት ስምምነት መግለጫ

ይህን ቅፅ አንብቤዋለሁ ወይም በምረዳው ቋንቋ ተነቦልኛል:: የጥናቱ አላማውን፣ አካሄዶቹን፣ ስጋቶቹን እና ጥቅሞቹን፣ ሚስጥራዊነት ጉዳዮቹን፣ የመሳተፍ መብቶችን እና ለማንኛውም መጠይቆች አድራሻውን በግልፅ ተረድቻለሁ። ግልፅ ባልሆኑ ጉዳዮች ላይ ጥያቄወችን እንድጠይቅ እድል ተሰጥቶኛል። በማንኛውም ጊዜ ከጥናቱ የመውጣት ወይም የማልፈልገውን ማንኛውንም ጥያቄ ላለመመለስ መብት እንዳለኝ ተነግሮኛል። ሰለዚህ ከዚህ በታች በተገለፀው መሰረት በዚህ ጥናት ለመሳተፍ በፍቃደኝነት መስማማቴን በፊርማዬ አረጋግጣለሁ።

የጥናቱ ተሳታፊ ስም እና ፊርማ: _____ቀን_____.

የመረጃ ሰብሳቢው ስም እና ፊርማ_____ቀን_____.

8.7. Afan Oromo Version of Participant Information Sheet And Informed Voluntary Consent Form (For Competent Adults: Ages ≥18 Years)

1. Seensa

Maqaan koo --------Ani kaniin hojjechaa jiru, akka odeeffannoo walitti qaba qoranichaf kan gaggeefamu Dr. Mangistu chalie kan digrii speciality ishaa Anesthesiology, critical care, and pain medicine Specialty at Haramaya University, the College of Health and Medical Sciences keessatti barachaa jira. Qorannichaa fi ati hirmaataa taatee filatte akkan ibsu xiyyeeffannoo kee akka naaf kennitu kabajaan isin gaafadha

2. Mata dureen qorannichaa: Tatamsa'inaafi sababoota dhiibbaa dhiigaa gadi bu'uu waliin walqabatan erga lafee dugdaatti anesthesia booda yeroo baqaqsanii hodhuu HFSCH Harar, Ethiopia 2024.

3. Kaayyoo qorannichaa: Argannoon qorannoo kanaa dhaabbileen fayyaa hawaasaa fincaan ofirraa ittisuu dadhabuu fi oomishtummaa dubartootaa ittisuu fi to'achuuf giddu-galeessa karoorfachuuf barbaachisummaa olaanaa ta'uu danda'a. Kana malees, kaayyoon qorannoo kanaa qorataa muummichaaf digrii addaa urogynecology guutuuf akka barbaachisummaa gartokkeetti barruu qorannoo barreessuudha.

4. Adeemsaa fi yeroo: Daataa barbaachisaa qorannichaaf gargaaru naaf kennuudhaaf gaaffilee fayyadamee isin gaafadha. Gaaffiiwwan 41 deebii kennuu qaban bakka ani gaaffii fi deebii isiniin guututti jiru. Gaaffii fi deebii gara daqiiqaa 30 waan fudhatuuf yeroo kana gaaffii fi deebii kanaaf akka na qusattan kabajaan isin gaafadha.

5. Balaa fi faayidaa: Balaan qorannoo kana irratti hirmaachuu baayyee xiqqaadha, garuu yeroo keessan irraa daqiiqaa muraasa qofa fudhachuudha. Qorannoon kana irratti hirmaachuuf kaffaltiin kallattiin hin jiraatu ture. Garuu argannoon qorannoo kanaa karoorsitoota fayyaa naannoo sanaaf odeeffannoo oarbaachisaa ta'e mul'isuu danda'a.

6. Iccitii: Odeeffannoon isin nuuf kennitan iccitii ta'a. Odeeffannoon addatti si adda baasu hin jiraatu. Argannoon qorannichaa hawaasa qorannichaaf waliigalaa kan ta'u yoo ta'u, waan addaa nama dhuunfaa kan hin calaqqisiifne ta'a. Gaaffiin maqaa agarsiisu akka hin dabalamneef koodii ni kennama. Gabaasa afaaniin ykn barreeffamaan hirmaattoota qorannicha waliin walqabsiisuu danda'u keessatti eeruun hin kennamu.

7. Mirga: Qo'annoo kanaaf hirmaannaan guutummaatti fedhii ofiitiin kan kennamudha. Qo'annoo kana irratti hirmaachuu fi dhiisuu kee labsuuf mirga qabda. Yoo hirmaachuuf murteessite yeroo barbaaddetti qo'annoo irraa ba'uuf mirga qabda kunis faayidaa kasaaraa karaa biraatiin siif malu kamiyyuu si hin mallatu. Gaaffii deebii kennuu hin barbaanne kamiyyuu deebisuun si hin barbchisu.

8. Teessoo quunnamtii: Yeroo kamiyyuu waa'ee qorannichaa gaaffiin ykn gaaffiin yoo jiraate, maaloo qorataa olaanaa, Dr. Mengistu Chalie, fi Email-mengistuchalie8@gmail.com, lakkoofsa bilbilaa

+251928448032; ykn Koree Gamaaggama Naamusa Qorannoo Fayyaa Dhaabbilee (IHRERC) bilbila waajjira 0254 66 2011 ykn P.O.BOX 235, Yuunivarsiitii Haramaya, Kolleejjii Saayinsii Fayyaa fi Meedikaalaa, Harar, Ethiopia

9. Labsii Hayyama Tola Ooltummaa Odeeffannoo Qaban: Akka waraqaa odeeffannoo hirmaattootaatti dubbiseera. Kaayyoo qorannichaa, hojimaata, balaa fi faayidaa, dhimmoota iccitii, mirga hirmaachuu fi teessoo quunnamtii gaaffii kamiyyuu sirriitti hubadheera. Wantoota ifa hin taane ta'uu danda'aniif gaaffii akkan gaafadhu carraan naaf kennameera. Yeroo barbaadetti qo'annoo keessaa ba'uuf ykn gaaffii ani hin barbaanne kamiyyuu deebisuuf mirga akkan qabu naaf himameera. Kanaafuu, qorannoo kana irratti hirmaachuuf fedhii kootiin mallattoo kootiin hayyama Koo nan ibsa.

Maqaa fi mallattoo Hirmaataa----------guyyaa: ----------

Maqaa fi mallattoo daataa walitti qabaa----------guyyaa: ----------

8.8. English Version Questionnaire

1. Sociodemographic

Ser. No	Variables	Response	Remark
101	Age	_____	
102	Resident	1. Rural	
		2. Urban	
103	Can you read and write?	1. Yes 2. No	
104	Referral status	1. health center	
		2. hospital	
105	BMI		
	Weight in kg if no BMI		
	Height in meter if no BMI		

2. Obstetric and medical related factors

201	Gestational age	_____weeks	
202	Gravidity		
203	Parity		
204	Indication for CS	1. Mal presentation	
		2. Non-reassuring fetal status	
		3. Previous scar	
		4. Previous scar and labour	
		5. Other indication	
205	Types of gestation	1. Single	
		2. Twin	
		3. Other	
206	Types of cesarean section done		
207	Preoperative hemoglobin		
208	Postoperative hemoglobin		
209	Hypertension	1. Yes 2. No	
210	History of preeclampsia	1. Yes 2. No	
211	History of eclampsia	1. Yes 2. No	
212	Preoperative anxiety	1. Yes 2. No	
213	Diagnosis of depression	1. Yes 2. No	
214	Diabetes mellitus	1. Yes 2. No	
215	Preoperative patient position before anesthesia	1. Lateral 2. Supine	
216	Baseline blood pressure systolic/diastolic (mmHg)		
217	Heart rate		
218	New born weight		
219	American Society of Anesthesiologists	I, II, III, IV, V, VI	

3. Characteristics of spinal anesthesia and drug used for prevention hypotension

301	Previous anesthesia exposure (when?)		
302	Site of puncture	1. L2-L3	
		2. L3-L4	
		3. L4-L5	
303	Spinal needle size	_____G	
304	Number of attempts		
305	Adjuvants used	1. Yes	
		2. No	
306	Type of adjuvants if used		
307	Dose of LA with adjuvants	_____	
308	Speed of injection of LA (over seconds)		
309	Sensory height block	1. >T6	
		2. ≤T6	
310	Time interval between anesthesia and skin incision		
311	Any prophylactic vasoactive drug given	1. Yes	
		2. No	
312	Types of uterotonic drugs used	1. Ergometrine	
		2. Oxytocin	
313	Dose of uterotonic drugs used	1. Ergometrine 0.25mg & oxytocin 20IU	
		2. Oxytocin 10IU	
		3. Oxytocin 20IU	
		4. Oxytocin 30IU	
314	Amount of crystalloids preloaded	_____ml	
315	Amount of crystalloid intraoperative	_____ml	
316	Estimated blood loss	_____ml	
317	Duration of surgery	_____hr and _____min	
318	Systolic BP on surgery	_____	

8.9. Amharic Version Questionnaire

1. ማህበራዊ ሁኔታን የተመለከቱ ጥያቄዎች

ተ.ቁ	ጥያቄ	ምላሽ	Remark
101	ዕድሜ	_____	
102	መኖሪያ ቦታ	1. ገጠር 2. ከተማ	
104	ማንበብ መፃፍ ይችላሉ?	1. አዎ 2. የለም	
104	ሪፈር የተደረገችበት ጤና ተቋም	1. ጤና ጣቢያ 2. ሆስፒታል	
105	ቢኤምአይ (BMI)		
	ክብደት በኪሎግራም ስንት ነዉ?		
	ቁመት በሜትር ስንት ነዉ?		

2. የፅንሱ እና አጠቃላይ የጤና ሁኔታ

201	እርግዝናው በሳምንት	_____ሳምንት
202	ስንትኛ እርግዝናዎት ነው?	I, II, III, IV,V, VI, >VI
203	ስንት ልጅ ወልደዋል?	I, II, III, IV,V, VI, >VI
204	በኦፕሬሽን የወለዱበት ምክንያት	1. አቀማመጡ ትክክል ስላልሆነ
		2. የፅንሱ ድህንነት ጥሩ (አስተማማኝ) ስላልሆነ
		3. የበፊቱ የወሊድ ኦፕሬሽን (ሲኤስ) ጠባሳ
		4. የበፊቱ የወሊድ ኦፕሬሽን (ሲኤስ) ጠባሳ እና ምጥ ላይ ስለሆንሁ
		5. ሌላ ምክንያት
205	የእርግዝናው አይነት	1. አንድ 2. መንትያ 3. ሌላ?
206	የተሰራው የሲኤስ አይነት	1.ታች አግድም 2. መሃል ለመሃል
207	ከኦፕሬሽን በፊት የተሰራ ሄሞግሎቢን (Hgb)	
208	ከኦፕሬሽን በኋላ የተሰራ ሄሞግሎቢን (Hgb)	
209	የደም ግፊት ምጨመር	1. አዎ 2. የለም
210	ፕሪ-ኢክላምሻ	1. አዎ 2. የለም
211	ኢክላምሻ	1. አዎ 2. የለም
212	ከኦፕሬሽን በኋላ ያለ መጨናነቅ	1. አዎ 2. የለም
213	ድብርት	1. አዎ 2. የለም
214	የስኳር በሽታ	1. አዎ 2. የለም
215	ከማደንዘዣ ከመሰጠቱ በፊት የታካሚ አቀማመጥ (በጎን ወይስ በጀርባ)	1. በጎን 2. በጀርባ
216	መንሻ የደም ግፊት ሲስቶሊክ / ዲያስቶሊክ (mmHg)	

217	የልብ ምት	
218	አዲስ የተወለደው ህፃን ክብደት	
219	የአሜሪካ የአናስታዚዮሎጂስቶች ማህበረሰብ ጤና ሁኔታ ምድብ	I, II, III, IV, V, VI

3. የስፓይናል አንስቴዢያው ሁኔታ እና የደም ግፊት እንዳይወርድ የተሰጡ መድሃኒቶች

301	ከዚህ በፊት የሰመመን መድሃኒት ወስደው ያውቃሉ? (መቼ?)	
302	የስፓይናል ፐንክቸር ቦታ	1. L2-L3 2. L3-L4
		3. L4-L5
303	ስፓይናል መርፌ መጠን	_____ጌጅ
304	የሙከራ ብዛት	
305	ተጨማሪ መዳህኒት	1. አዎ 2. የለም
306	የተጠቀሙት ተጨማሪ መዳህኒት አይነት	
307	የሎካል አኒስቴቲስት መድሃኒት መጠን	_____
308	የሎካል አኒስቴቲስት አሰጣጥ ፍትነት (በሰከንድ)	
309	ማደንዘዣዉ የደረሰበት ከፍታ	1. >T_6 2. ≤T_6
310	በማደንዘዣ እና በኦፕሬሽን መጀመር መካከል ያለው የጊዜ ክፍተት	
311	የደም ግፊት እንዳይወርድ የተሰጡ መዳኒቶች አሉ?	1. አዎ 2.የለም
312	ለታካሚዋ የተሰጡ የዩትሮቶኒክ መድኃኒቶች ዓይነት	1. ኢርጎሜትሪን
		2. ኦክሲቶሲን
313	ለታካሚዋ የተሰጡ የዩትሮቶኒክ መድኃኒቶች መጠን	1. ኢርጎሜትሪን 0.25 ሚግ & ኦክሲቶሲን 20IU
		2. ኦክሲቶሲን 10IU
		3. ኦክሲቶሲን 20IU
		4. ኦክሲቶሲን 30IU
314	ከስፓይናል በፊት የተሰጠ IV ፍሉድ ምጠን	_____ሚ.ሊ
315	በኦፕሬሽን ጊዜ የተሰጠ IV ፍሉድ መጠን	_____ሚ.ሊ
316	በኦፕሬሽን ጊዜ የደማው የደም መጠን	_____ሚ.ሊ
317	ቀዶ ጥገናው የፈጀው ሰአት	_____hr and _____min
318	በኦፕሬሽን ጊዜ የተመዘገበ ዝቀተኛ ደም ግፊት	_____ከ _____ ደቂቃ በኋላ

8.10. Afan Oromo Version Questionnaire

1. Hawaas-dimoogiraafii

Ser.	Jijjiiramoota	Deebii	Yaada
101	Umurii	_____	
102	Resident 102 Jiraataa	1. Baadiyyaa	
		2. Magaalaa	
103	Dubbisuu fi barreessuu ni dandeessaa?	1. Eeyyee 2. Lakki	
104	Haala rifaralaa	1. buufata fayyaa	
		2. hospitaala	
105	BMI jedhamuun beekama		
	Ulfaatina kg yoo BMI hin qabne		
	Olka'iinsa meetiraan yoo BMI hin qabne		

2. Qabxiilee dahumsaa fi yaala waliin walqabatan

201	Umriin ulfaa	_____torban
202	Urjii ulfaa	
203	Walqixxummaa	
204	Indication for CS	1. Dhiyeessii mal
		2. Haala daa'ima gadameessa keessa jiru kan hin mirkaneessine
		3. Cirracha kanaan duraa
		4. Cirracha duraan fi ciniinsuu
		5. Agarsiisa biroo
205	Gosoota ulfaa	1.Single 2.Lamaan 3. Kan biroo
206	Gosoota qaama saalaa baqaqsanii hodhuu raawwatame	
207	Himoogilobiinii baqaqsanii hodhuu duraa	
208	Himoogilobiinii baqaqsanii hodhuu boodaa	
209	Dhiibbaa dhiigaa	1. Eeyyee 2. Lakki
210	Seenaa dhukkuba preeclampsia	1. Eeyyee 2. Lakki
211	Seenaa dhukkuba eclampsia	1. Eeyyee 2. Lakki
212	Yaaddoo baqaqsanii hodhuu duraa	1. Eeyyee 2. Lakki
213	Qorannoo dhiphina sammuu	1. Eeyyee 2. Lakki
214	Dhukkuba sukkaaraa	1. Eeyyee 2. Lakki

215	Jijjiirama ejjennoo baqaqsanii hodhuu duraa dhiibbaa dhiigaa	1. Lateral 2. Supine position
216	Dhiibbaa dhiigaa bu'uuraa sistoolikii/diyaastoolikii (mmHg)	
217	Dha'annaa onnee	
218	Ulfaatina dhalattoota haaraa	
219	Waldaa Ameerikaa kan Ogeessota Anesthesiologists	I, II, III, IV, V, VI

3. Amaloota qoricha sammuu namaa hadoochu lafee dugdaa fi qoricha dhiibbaa dhiigaa ittisuuf oolu

301	Saaxila qoricha sammuu namaa hadoochu kanaan dura (yoom?).		
302	Bakka itti bocame	1. L2-L3	
		2. L3-L4 kan jedhu	
		3. L4-L5 kan jedhu	
303	Guddina cirracha lafee dugdaatti	_____G	
304	Baay'ina yaalii		
305	Gargaarsa fayyadaman	1. Eeyyee	
		2. Lakki	
306	Gosa gargaartotaa yoo fayyadamne		
307	Doosii LA gargaartoota waliin _____.	_____	
308	Saffisa lilmoo LA (sekondii irratti).		
309	Blookii olka'iinsa miiraa	1. >T6	
		2. ≤T6	
310	Yeroon anesthesia fi cirracha gogaa gidduu jiru		
311	Qoricha vaazoactive prophylactic kamiyyuu kenname	1. Eeyyee	
		2. Lakki	
312	Gosoota qoricha gadameessaa fayyadaman	1. Ergometrine	
		2. Oksaayitoosiin	
313	Doosii qoricha gadameessaa fayyadaman	1.Ergometrine 0.25mg & oxytocin 20IU	
		2. Oksitoosin 10IU	
		3. Oksitoosin 20IU	
		4. Oksitoosin 30IU	
314	Hamma kiristallooyidii dursanii fe'aman	_____ml	
315	Hamma kiristallooyidii baqaqsanii hodhuu keessaa	_____ml	
316	Tilmaama dhiiga dhabuu	_____ml	
317	Yeroon baqaqsanii hodhuu	_____hr fi _____min	
318	Dhiibbaa dhiigaa sistoolikii baqaqsanii hodhuu irratti	_____	